

2.0 Project Description

2.1 Introduction and Overview

CE Obsidian Energy, LLC (Applicant/CE Obsidian) currently possesses a license to construct a geothermal generating plant on an 80-acre site in Imperial County, California. The project was designated as “Salton Sea Unit 6” and was originally granted a license by the California Energy Commission (CEC) in December 2003 for a 185 MW plant utilizing multiple flash technology. The original 2003 license was amended in May 2005 to enable the plant to increase its capacity to 215 MW (referred to herein as the “original project”). The Applicant petitioned, and the CEC subsequently granted, an extension to the Salton Sea Unit 6 license, making it effective until December 18, 2011.

The Applicant, through this Amendment Petition, seeks to amend the currently effective license to allow for the construction of three smaller geothermal plants that will produce a combined total of 159 MW net (nominal) of clean, renewable energy (referred to herein as the “Amended Project”). It consists of three single flash 53 MW net (nominal) individual units (referred to as Black Rock Units 1, 2, and 3). As with the original project, these plants will be operated as “base load” plants, i.e., essentially continuous (24 hours per day; 7 days per week; 50 plus weeks per year) operation. A photograph of the plant site in its current condition and a simulation of the plant site with the proposed facilities overlaid are provided on the following pages. This is a distinct advantage of geothermal as a renewable source of energy compared to other renewables such as solar and wind. An ancillary benefit is that this type of operation greatly facilitates grid stability and makes dispatching easier for the grid operator. Consistent with the pre-filing meeting held in November 2008 between the Applicant and CEC staff, this Amendment Petition has been structured so as to focus on differences between the original and Amended Projects in terms of project characteristics (i.e., Section 2.0, Project Description), as well as potential impacts and associated proposed mitigation measures (Section 5.0, Environmental Impacts)

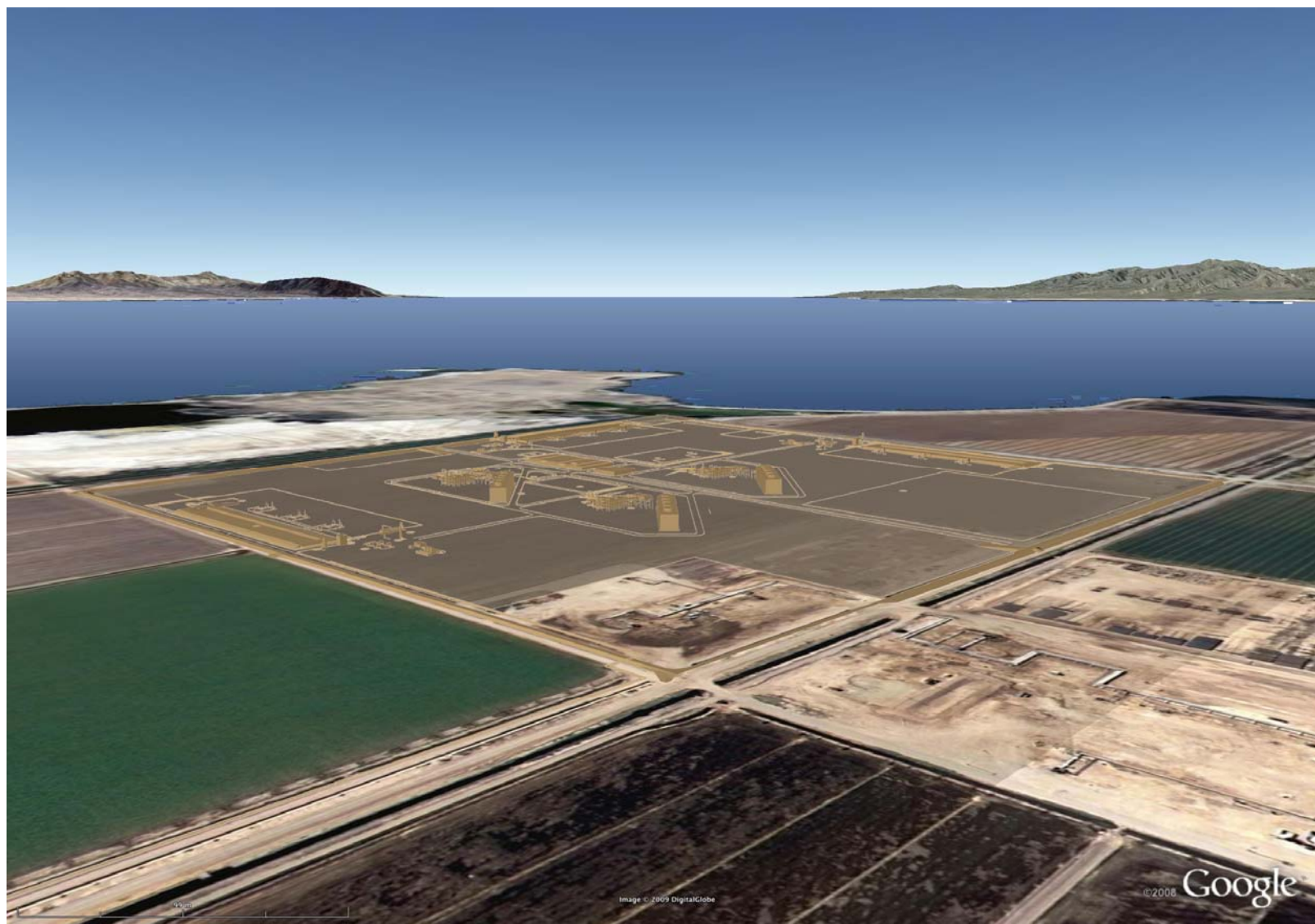
The Applicant proposes to construct the three smaller plants on the same 80-acre site as the original project. In addition, the Amended Project will utilize a contiguous 80-acre site to the south of the original site for a total plant site size of 160 acres. Increasing the main plant site size from 80 to 160 acres allows for more compact construction of the Amended Project as a whole. This allows for reducing certain direct and indirect impacts that potentially might have been encountered by the original project. Examples of this include:

- Relocation of all of the production wells (OB-1, 2, and 3) to the main plant site. This reduces impacts to proximate wetlands and wildlife refuge areas associated with construction and operations as well as shortening the cross-country pipeline impacts for the production wells.
- Allowing for certain operating infrastructure to be shared by all three plants. This reduces impacts associated with construction by eliminating redundant facilities.
- Using the plant site proper for laydown and construction parking. This mitigates temporary impacts from these activities as these areas were previously not slated for location on the main plant site.

Project Site – Existing Conditions



Project Site – With Simluated Project Facilities



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- Allowing for the construction of a single, shared stormwater detention basin.

The Amended Project will necessitate the creation of a “borrow” site from which earth will be excavated for construction of the site perimeter berm. As discussed elsewhere, this site will be restored to its original condition with topsoil stripped from the main plant site during site initial site grading operations. The Amended Project will use single flash technology in lieu of the originally licensed multiple flash technology, which requires considerably more plant infrastructure than single flash. . In general, each of the three generation plants to be constructed in association with the Amended Project will consist of two major components:

- A Resource Production Facility (RPF), consisting of brine production and injection wells, associated pipelines, and ancillary facilities including a brine pond; and
- A Power Generating Facility (PGF), consisting of a steam turbine generator (STG), condenser, cooling tower array, noncondensable gas (NCG) handling equipment and ancillary equipment, and two emergency diesel generators.

The Amended Project will have three brine production well pads with three wells each; the production well pads will be located on the plant site. The Project also will include three offsite brine injection well pads, each with three wells. The 160-acre plant site will also contain infrastructure common to all three Black Rock units, including a control building, an electrical switchyard, two fire water pumps, and fire water, process water and condensate storage tanks. Table 2-1 summarizes the major physical and operational differences between the original project and the Amended Project.

**Table 2-1 Major Physical and Operational Differences between
Original SSU6 and Amended Project**

Original SSU6 Project	Amended Project
One geothermal power plant with 215 MW (net) capacity. Power block located in northern portion of the plant site.	Three 53 MW (net) geothermal power plants (Black Rock Units 1-3); 159 MW (net) total capacity. Power blocks located in center of the site.
Multiple flash technology (more complex with more plant infrastructure, e.g., crystallizers, clarifies, and reactors).	Single flash technology (simpler technology with less infrastructures than multiple flash).
Eleven production wells on five well pads and eight injection wells on three well pads, all located offsite. Two of the production well pads located contiguous with the Sonny Bono Wildlife Refuge.	Nine production wells on three well pads, all within the plant site. Nine offsite injection wells on three well pads, but at different locations than the original project. No wells proximate to the Wildlife Refuge.
Plant operations (multiple flash technology) would have generated 142 tons per day of silica filter cake requiring landfill disposal off site (material handling on site and truck transport, both generating air emissions).	Single flash process will generate no filter cake waste during normal operation, thus, minimal truck transport of waste and minimal landfill use required.
Project would have employed LO-CAT® plus Sulfurite® to control hydrogen sulfide plus process humidity conditioning and carbon adsorption	Recuperative Thermal Oxidizer (RTO) will be used for NCG treatment. RTO avoids generation of mercury-contaminated sulfur waste and also

Table 2-1 Major Physical and Operational Differences between Original SSU6 and Amended Project

Original SSU6 Project	Amended Project
technology for benzene and VOC control. It would have generated up to three tons per day of sulfur potentially contaminated with mercury, requiring landfill disposal (e.g., onsite waste handling and offsite transport, both generating air emissions). LO-CAT® does not control volatile organic compound (VOC) or benzene emissions.	reduces emissions of VOC, benzene and methane by 95 percent.

As noted in Table 2-1 and shown in Figure 2-1 at the end of this section, the original SSU6 project had all eleven production wells and all eight injection wells located off the main plant site. One of these production well pads (OB-3) would have been located on Obsidian Butte, and McKendry Road would have been widened to serve this well pad, impacting adjacent wetlands. The Amended Project has all production wells on the plant site. Accordingly, there will be no well pad or pipelines on Obsidian Butte and McKendry Road will not be widened.

In May 2005, the CEC amended the original AFC, allowing for the addition of a binary-cycle turbine to the original project through Order No. 05-0511-02 (Docket No.: 02-AFC-2C). This amendment to the original AFC also included permission to construct one additional production well and one additional injection well.

By comparison, the Amended Project will include nine production wells on three well pads, as well as two plant injection wells and two aerated brine injection wells. All thirteen of these wells will be located on the plant site. The relocation of the production wells and associated pipelines to the plant site from their previous off-site locations will have the following effects:

- Removing the OB-1 production well pad from its proximity to the Sonny Bono Salton Sea National Wildlife Refuge will significantly reduce the potential for wildlife impacts identified in the original AFC; and
- Removing the OB-3 production well pad from Obsidian Butte will avoid impacts to previously identified wetlands and wildlife from the production piping leading from this well pad to the main plant site.

As with the original SSU6 project, three injection well pads are proposed for the Amended Project. However, the number of injection wells will be increased from seven to nine (three wells on each well pad). The injection well pads will be located generally to the south, southeast, and east of the main plant site. Because the Amended Project's well pads are located closer to the plant site than in the original SSU6 project, associated pipelines will be shorter.

The Amended Project site is located approximately six miles northwest of Calipatria, California. The site is currently used for agriculture. Land uses in the surrounding area include existing geothermal power facilities, agriculture, wildlife management, and the Sonny Bono National Wildlife Refuge. Figure 2-1 presents a regional overview of the plant site, including proposed transmission lines and brine injection pipelines and well pads.

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As with the original SSU6 project, electricity generated by the Amended Project will be delivered to the grid by the Imperial Irrigation District (IID) via two interconnection lines operated at 230 kilovolt (kV). The first of these lines will connect the Amended Project to an existing electrical substation near Niland, California (the “Midway” interconnection line). The second of the two lines (the “L” interconnection line) will connect the Amended Project to the “L” transmission line located west of State Route 86 (SR 86) via a proposed switching station called the Bannister Switching Station. The transmission line routes are shown in Figure 2-1. Because the transmission lines of the Project are unchanged from those for the original project, the impacts of the transmission lines are the same and only minimal additional discussion of transmission lines is provided below and in Section 5.14, Transmission.

The Amended Project requires water for the following operations: cooling tower make-up water, process water uses, dilution of acid for scale control in brine injection pipelines, and as supply to a reverse osmosis (RO) water purification system to meet potable water needs. The Project will satisfy approximately 95 percent of its water needs by recycling steam condensed from the produced geothermal brine. IID will supply the remainder of the water from an agricultural canal adjacent to the plant site. Water drawn from the IID canal is estimated at an unlikely maximum of approximately 317 acre feet per year (afy) for each of the three Black Rock units or 953 afy total. Expected (“most likely case”) IID water use will be approximately 161 afy per plant for a total of 483 afy.

Water will be supplied under the same agreement with the IID as was developed for the original project that allows up to 1,000 afy of water use. Project water use will be offset by the reduction in water use resulting from the removal of Project site acreage from agricultural production (see Sections 5.7, Land Use and 5.17, Water Resources). Because of this avoided agricultural water use, the net water use for the Amended Project will represent a total decrease of approximately 296 afy for the most likely case water consumption estimates, and an increase of approximately 174 afy based on conservative consumption estimates. Transfer of water to the plant service water pond will be via a proposed 500-foot-long buried 10-inch pipeline from an IID canal adjacent to the plant site.

The Amended Project will supply capacity and energy to southern California’s electric market. “Off take” and Interconnection Agreements with IID associated with the original SSU6 project have been terminated. As of the date of this AP, the Applicant is engaged in active negotiations with potential off takers in the southern California region for the three plants. For Black Rock-1, the Applicant and the off taker have agreed to basic terms. It is expected that a Power Purchasing Agreement (PPA) will be concluded by the second quarter of 2009. Negotiations for Black Rock-2 and -3 are ongoing. The Applicant has applied for a new Interconnection Agreement with IID, and a System Impact Study (SIS) will be implemented for the off taker. Upon conclusion of the PPA negotiations, the Applicant will move forward with IID to address identified system impacts to accommodate transmission of energy to the off taker.

The Project will initially be owned by CE Obsidian and operated by CalEnergy Operating Corporation, an affiliate of CEOE, except for the transmission lines. The transmission lines will be constructed, owned, maintained, and operated by IID. It is contemplated that there will ultimately (pre- or post-construction) be three different owners of the three power plants and their associated production and injection wells. Each of those Project owners will likely have their own, separate lenders who will insist that permit compliance conditions be limited to the Project it has lent to. As such, Conditions of Certification should be tailored to provide clear rights and obligations for the three plants with certain overall conditions of compliance remaining the obligation of CE Obsidian.

2.2 Project Objectives

The principal objective of the Amended Project is to supply clean, renewable geothermal electric energy to serve the electrical load requirements in California.

Objectives for the Amended Project included within the principal objective are as follows:

- To further develop geothermal energy production within the Salton Sea Known Geothermal Resource Area (KGRA) in proximity to recoverable geothermal resource, water supply, and electrical transmission lines.
- To use commercially feasible methods to achieve prompt and efficient development of geothermal resources, a renewable energy source, and provide a fair return on the project investment.
- To develop a project that will be sufficiently attractive to the investment community so that the required construction funds may be obtained.
- To construct, operate and maintain an efficient, economic, reliable, safe and environmentally sound geothermal facility that will help achieve: (i) the State of California objectives mandated by SB 1078 (California Renewable Portfolio Standard [RPS] Program), (ii) the objectives of the Executive Order issued by Governor Arnold Schwarzenegger in November 2008, which called for an increase in the RPS to 33 percent renewable energy in 2020, (iii) the objectives of AB 32 (California Global Warming Solutions Act of 2006), and (iv) other local mandates adopted by the State's municipal electric utilities to meet the requirements for the long term wholesale purchase of renewable electric energy for distribution to their customers.
- To enhance the reliability and stability of the IID grid in Imperial and Riverside Counties.
- To contribute to the diversification of Imperial County's economic base by providing increased employment opportunities and additional revenue sources from commercial geothermal development.

2.3 Location of Facilities

Figure 2-1 illustrates the location of the Project facilities. The Project is located southeast of the Salton Sea in an unincorporated area of Imperial County. This region of the Imperial Valley is used mostly for agriculture and geothermal power production. The footprint of the 160-acre Amended Project plant site (parcel APN 020-110-08) is twice the size of the original project plant site. Also, the Amended Project will utilize approximately 34 acres east of Gentry Road as a borrow site. However, whereas the original project used an offsite construction laydown and parking area, the Amended Project construction laydown and parking areas are on the plant site. The footprint has been further minimized by relocating to the plant site the production wells, plant injection wells, and associated pipelines that were offsite in the original SSU6 project. In total, the Amended Project facilities will have temporary impacts on approximately 15.5 percent more acreage than the original SSU6 project (approximately 243 total acres v. 210 acres for the original project) and permanent impacts on approximately 14.8 percent more acreage (213 acres v. 186 acres).

The plant site, which is currently used for agriculture, is bounded by McKendry Road to the north, Severe Road to the west, Peterson Road to the south, and Boyle Road to the east. No subdivision of the Amended Project site is necessary as the entire parcel is owned by Imperial Magma, LLC, an affiliate of the Applicant.

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The town of Calipatria is located approximately six miles to the southeast of the plant site and the town of Niland is located 7.5 miles northeast. The Sonny Bono Salton Sea National Wildlife Refuge Headquarters is located 0.8-mile from the plant site. The Alamo River and New River are 4.8 miles southwest and 2.7 miles east of the plant site, respectively. Nine existing geothermal power plants owned and operated by affiliates of the Applicant are located within a two-mile radius of the proposed site (see Figure 2-2). Geothermal Power Plant Units 1, 2, 3, 4 and 5 (referred to as Region 1) are to the southwest of the plant site, the Vulcan and Hoch (Region 2) geothermal plants lie to the southeast, and the J.J. Elmore and Leathers geothermal plants are to the northeast of the proposed site.

The proposed plant site is located in the southwest quarter of Section 33 Southwest, Township 11 South, Range 13 East, San Bernardino Meridian. Ownership information for the properties surrounding the site and along the linear facilities routes is provided in Appendix A to the Amendment Petition. Geothermal leaseholds are shown on Figure 2-2. Assessor parcel numbers of the leaseholds are shown in Figure 2-3.

The three geothermal power plants will be located near the center of the site, while the nine production wells (three well pads) will be located on along the north, west, and south perimeters of the site. The nine injection wells (on three separate well pads) will be located off site, approximately 8,000 to 10,000 feet south, southeast, and east of the plant site (see Figure 2-1). The plant site, well pads, and associated pipelines are located on lands under the jurisdiction of Imperial County.

2.3.1 Regional Geothermal Resources

The Project is located in an area known as the Salton Trough. The Salton Trough is a 3,100-square-mile geological structural depression that extends from the Transverse Mountain Range on the north to the Gulf of California on the south. The California Division of Mines and Geology recognizes the Salton Trough as an area with a deep saline aquifer of sufficient temperature for potential geothermal energy development. The Salton Sea is a KGRA, as defined by the United States Geological Survey (USGS). The Salton Sea KGRA encompasses 161 square miles (102,887 acres). The USGS has designated nine KGRAs in Imperial County, including the Salton Sea KGRA. The California Department of Oil, Gas and Geothermal Resources (CDOGGR) has also designated the Salton Sea as a geothermal field.

Commercial operation of the Salton Sea field began in 1982 at Unocal's Unit 1 power plant and expanded in 1986 with Magma's Vulcan plant. Since then, four additional generating units have been added in the original Unocal development area, and three additional units have been built in the Magma area (Table 2-2). The original development areas and all plants in the field are now operated by affiliates of the Applicant.

Table 2-2 Salton Sea KGRA Development History

Plant	Net MW	Startup Date
Unit 1	10.0	1987
Vulcan/CE Turbo	44.0	1986/2000
Del Ranch (Hoch)	38.0	1989
Elmore	38.0	1989
Unit 3	49.8	1989
Leathers	38.0	1990

Table 2-2 Salton Sea KGRA Development History

Plant	Net MW	Startup Date
Unit 2	20.0	1990
Unit 4	39.6	1996
Unit 5	49.0	2000
Total Existing	326.4	

Approximately 4,808 acres of the 102,887 resource acres of the Salton Sea KGRA are currently developed, and that acreage supports the generation of approximately 350 gross (340 net) MW of electricity. The Project will add 233 resource acres to development and will support 159 net MW of additional electric power generation. Table 2-3 summarizes the acreages of Amended Project components.

2.3.2 Project Site Selection

The general arrangement of the Amended Project facilities incorporates a layout conducive for generating energy from the Salton Sea Geothermal Field (Field). The Project uses the available acreage at a spacing that avoids potential interference between production and injection wells, while preserving the viability of the geothermal resource. Production and injection wells for the Amended Project are sited to maintain the renewable nature of the geothermal resource. Proper distance is maintained between production areas to ensure that the production wells receive adequate pressure support to maintain their productivity. The arrangement of both the injection and production wells was modeled employing CE Obsidian's proprietary well field development model. The model is used to locate injection wells in such a manner that spent production fluids are returned to a portion of the formation underlying the site which is geologically and hydraulically isolated from the production well field. Extreme care is exercised in order to closely balance the production and injection volumes to avoid subsidence and depletion of the geothermal resource.

Table 2-3 Estimated Area of Disturbance for the Amended Project

Project Element	Length	Area of Disturbance		Acres	
	(miles)	Temporary	Permanent	Temporary	Permanent
Energy Facility	N/A	160 acres	160 acres	160.0	160.0
Production Wells	N/A	Nine Production Wells – Located on Energy Facility Site	Nine Production Wells – Located on Energy Facility Site	N/A	N/A
Injection Wells	N/A	Three Well Pads (4.7 acres/each – each with three Injection wells)	Three Well Pads (4.7 acres/each – each with three Injection wells)	14.1	14.1
Production Pipelines	N/A	NA (all onsite and included with totals above)	NA (all onsite and included with totals above)	N/A	N/A
Injection Pipelines	3.2	110-foot ROW (all outside the plant site)	110-foot ROW (all outside the plant site)	39.3	39.3

Table 2-3 Estimated Area of Disturbance for the Amended Project

Project Element	Length	Area of Disturbance		Acres	
	(miles)	Temporary	Permanent	Temporary	Permanent
Borrow Site	N/A	34 acres	N/A	34.0	N/A
Total Disturbance	N/A	N/A	N/A	242.8 ¹	213.4 ¹
Notes: N/A = Not Applicable					
¹ Includes 4.6 acres of overlap between offsite injection pipelines and borrow site.					

The general principles that were used in locating the wells for the Amended Project are as follows:

- Production wells will be located north of the main blind fault.
- Development will be as close to the main blind fault as possible.
- Separation will be maintained between production and injection wells to prevent breakthrough of injection fluids.
- Production wells will be spaced apart from one another to prevent decline in the production rates for existing geothermal plants.
- Only three wells will be allowed per pad, to prevent/limit interference between wells at the casing shoe. Well pads will have adequate distance between them to prevent interference.

The geothermal resource underlying the Amended Project area was independently evaluated by GeothermEx, Inc. with respect to its ability to sustain the original project. The evaluation concluded that the geothermal resource in the area proximate to the Amended Project site could viably sustain the original 185 MW project. As part of the original SSU6 proceedings, both CEC staff and CDOGGR staff presented written testimony concluding that the proposed expansion of the geothermal field could supply sufficient resources in commercial quantities for the life of the project. CDOGGR mentioned a 2002 study that estimated a total resource potential of 2,300 MW and resource potential in the onshore portion only of 900 MW. CEC staff mentioned estimates developed by Union Oil's Geothermal Division (at that time Union Oil and Magma Energy, Co. were the major resource holders at the Salton Sea KGRA; both of these companies' holdings have since been acquired by the affiliates of the Applicant). Union Oil came to the conclusion that there was as much as 25,000 MW available for 30 years in the KGRA. The CEC staff noted the large disparity between the CDOGGR and Union Oil estimates and concluded that the true capacity of the resource was somewhere between the two extremes of 2,300 MW (CDOGGR) and 25,000 MW (Union Oil).

2.3.2.1 Well Pad Locations

There are nine proposed production wells, to be located on three well pads, and nine proposed brine injection wells, to be located on three separate well pads. Production well pad OB-1 (on the plant site) will support three wells that would fully develop an undeveloped area between the existing geothermal facilities in what the Applicant refers to as Region 1 and Region 2. This well is not in the primary drainage area of

any currently producing wells. With both Region 1 and Region 2 production wells pulling on this area, it is critical not to overdevelop this area.

Production well pad OB-2 (also on the plant site) will have three wells that drain the remaining undeveloped area between Region 1 and Region 2 and the area just off the northwestern edge of Region 2. Production well pad OB-3 (inside the plant site on the northeast corner) will have three wells that drain the area just off the northern edge of Region 2. These well pads are all adjacent to existing plant well fields. Reservoir modeling has determined that bringing these wells any closer to the existing plants could adversely impact the decline rates of existing wells and other proposed Amended Project wells.

The Amended Project brine injection wells were sited south of the main blind fault at an adequate distance from existing or proposed production wells, in an area that would not be considered for production but that is close enough to provide pressure support. The addition of Amended Project injection wells to the southeast will increase pressure support to the existing Region 2, balancing the pressure support lost from the new production development. Reservoir properties vary in lateral distance and depth, and are interdependent. The reservoir properties and Field production response were mathematically modeled and matched to historic data from over 10 years of production. The Amended Project layout was superimposed into the numerical model to forecast its effect on the reservoir and existing well fields over the life of the plant. Location, spacing, production rates, and pressure support were balanced to provide acceptable well field dynamics for the Amended Project employing the above criteria.

In modeling the locations of the production and injection wells associated with the Amended Project, potential impacts associated with construction and operation were carefully considered. Utilizing an interpretation of a recently acquired three dimensional (3D) seismic survey report, CE Obsidian was able to relocate all of the production well pads onto the plant site. In so doing, both construction and operation of these well pads will be significantly less disruptive of nearby wetlands and indigenous wildlife. In addition, an economic evaluation was performed taking into consideration the initial capital cost of the alloy production piping, accurate information on the three dimensional distribution of the resource underlying the Project site, the cost of directional boring to achieve well productivity versus installation of aboveground piping, and availability of ROW to route aboveground piping. Thus, well arrangement associated with the Amended Project, while differing from the original project configuration, represents an alternative which is supported by an improved understanding of the geothermal resource, is economically supportive of the Project's financial objectives, and further accommodates the environmental setting of the Project.

2.3.2.2 Regional Surface Subsidence

Improper management associated with the extraction of geothermal fluids has been known to cause regional subsidence proximate to other geothermal projects. The Applicant's ongoing operations, as well as the Amended Project, incorporate carefully planned and executed re-injection of geothermal fluids. The success of this program is continuously evaluated by the Applicant through monitoring of reservoir geophysical data and surface subsidence proximate to the existing operating plants and well field. With over two decades of operation, this monitoring indicates insignificant impacts to the geothermal resource and no significant surface subsidence. Because the Applicant intends to extend its resource management and monitoring programs to encompass the Amended Project, depletion of the geothermal reservoir and surface subsidence impacts will be less than significant.

2.4 Site Description

The Project site is described in the following subsections.

2.4.1 Existing Site Conditions

The Project is located in an area of Imperial County that is currently used for agriculture. A photograph of the site in its current condition is presented as Figure 2-4. The site is largely flat, with an average elevation of 225 feet below mean sea level.

2.4.2 Site Surveys

A preliminary geotechnical evaluation of the Project plant site was performed in 2002 as part of the original project AFC to evaluate general subsurface conditions, seismicity, and other geologic hazards and to provide recommendations for design and construction of the foundations for Project structures. The study evaluated 80 acres of the Amended Project's 160-acre plant site. Another geotechnical evaluation of the remaining 80 acres of the plant site was performed in 2008, along with a more detailed investigation of the original 80 acres. The 2008 study came to the similar conclusions as the 2002 study for the adjoining acreage. In general, the studies found the plant site to be geotechnically feasible for construction of the proposed electrical generating facilities. Engineering design criteria for the Amended Project (foundations and civil, seismic and structural, mechanical, control systems, and electrical) are provided in Amendment Petition Appendix C.

2.5 Generating Facility Description

Each of the three geothermal power plants consists of two major components, the RPF and the PGF, as well as various support facilities and equipment. The RPF includes all the brine and steam handling facilities from the production wellheads to the injection wellheads. It also includes a brine injection system, brine ponds, and steam polishing equipment designed to provide turbine-quality steam to the PGFs. Each PGF will have a "rock muffler" to vent steam for brief periods of time in the event of a plant "trip" (i.e., emergency shutdown). Plant trips can occur as a result of a mechanical problem within either the PGF or the RPF, or as a result of the local electric grid's inability to take power generated by the PGF.

Each RPF will have a Production Test Unit (PTU). The PTU is an atmospheric flash tank into which brine is pumped during production well startup. Brine is circulated through this tank until a sufficiently high temperature is reached. The brine flow is then shunted to the high-pressure (HP) separator for steam production to feed the PGF. Brine passing through the PTU is eventually discharged to the brine pond. Because the brine at this point has been exposed to the atmosphere, it is referred to as "aerated brine". This aerated brine is then pumped into one of two aerated brine injection wells located on the plant site. A small amount of the brine may form solids, which will be disposed of appropriately.

The PGF includes a condensing turbine/generator set, the NCG removal and abatement systems, and the heat rejection system (i.e., cooling towers). The PGF also includes several power distribution centers. Facilities common to all three PGFs include a 230-kV switchyard, a control building, a fire water pond, a raw water pond, a condensate pond, and other support facilities.

The Amended Project is described in the following sections, including the site arrangement, a general overview of the geothermal power process, followed by more detailed descriptions of the processes and equipment that constitute the RPF, PGF, electrical system, and support facilities.

2.5.1 Site Arrangement

Approximately 160 acres of land are required to accommodate the Amended Project plant facilities, which include the following project elements with their approximate footprints:

- Three PGFs (400 feet by 500 feet);
- Three RPFs (400 feet by 700 feet);
- One centrally located electrical/control building for all three power plants (300 feet by 500 feet);
- Three cooling towers, i.e., one for each of the three power plants (each cooling tower is 140 feet by 35 feet and has five cells),
- One electrical switchyard for each of the three power plants (275 feet by 150 feet each) discharging to a single ring bus;
- Three brine ponds, one for each of the three power plants (636 feet by 58 by 7.5 feet each);
- One storm water detention pond for all three power plants (112,500 square feet);
- Three emission control systems, one for each of the three power plants (50 feet by 50 feet each);
- One parking area for all three power plants (124 feet by 84 feet); and
- Other ancillary facilities and equipment.

There will be three new onsite production well pads with three wells each and nine offsite injection wells on three separate well pads (average size of 4.7 acres each). Additionally, two well pads will be constructed on the plant site to accommodate four new injection wells: two of the injection wells will be dedicated to injection of excess condensate mixed with cooling tower blowdown (known as “plant” injection wells) and two will be dedicated to injection of aerated brine when accumulated in the brine ponds (“aerated brine” injection wells). Injection wells will be directionally drilled to minimize the well pad size.

Figure 2-4 is an aerial photograph showing the Project site and surrounding area at the present time; Figure 2-5 is the same aerial photograph with the simulated Amended Project facilities added. The General Arrangement Site Plan for the Amended Project is shown in Figure 2-6. Figures 2-7a and 2-7b show isometric drawings of the brine and condensate injection wellheads and piping. Elevation drawings are shown in Figures 2-8a (east/west view) and 2-8b (north/south view). An isometric view of the facility is shown in Figure 2-9.

2.5.2 Process Description

The Amended Project includes three RPFs, three PGFs, and ancillary facilities. The Project includes three high-efficiency condensing steam turbines with a net unit output of 53 MW each (159 MW total). Under normal operation, the facility will be operated at a base load mode of approximately 8,000 hours per year or

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more. The design of the RPF utilizes a single stage flash to produce the required steam supply to the turbine.

The RPF includes the production pipelines, from the production wellheads and warm-up header to the production manifold, the injection piping to the injection wells, the brine and steam handling facilities from the production manifolds, the steam and brine piping, and the HP separator and steam scrubber. It also includes the aerated brine injection system from the brine pond, the PTU to be used for well startup and as a steam relief-venting system to support operations during startup/shutdown and emergency conditions, and steam polishing equipment designed to provide turbine-quality steam to the PGF.

The PGF includes the steam demister, turbine/generator system, and heat rejection system. The heat rejection system includes the main condenser, chemical oxidizer, air emissions control system for control of hydrogen sulfide (H₂S) and benzene emissions, and the cooling tower and cooling water distribution system.

The overall process operates as follows: hot, high-pressure geothermal fluid (brine) is extracted from the geothermal reservoir through three production wells located on the power plant site. The two two-phase steam and brine flow to a steam handling system consisting of a HP separator, a scrubber, and a demister. Via the steam handling system, the steam is separated from the geothermal fluid (flashed) to produce HP steam that is sent to the PGF for use in the steam turbine. The flash point is set to avoid solids precipitation in the depleted brine and the depleted brine can be further chemically conditioned if need be with hydrochloric acid to prevent scale formation in the process piping or injection wells, and injected back into the formation through the injection wells. The facilities and equipment that handle the brine constitute the RPF.

Steam from the RPF is conditioned through scrubber and demister stages in the PGF and sent to the steam turbine which drives a generator for power production. The depleted steam leaves the turbine and enters a shell-and-tube heat exchanger which condenses the steam to water. Cooling water for the heat exchanger is provided by a piping loop from the cooling towers. Water condensed in the heat exchanger is used for cooling water make-up in the cooling tower, among other (much smaller quantity) uses. NCGs released from the condensed steam are evacuated from the heat exchanger using a vacuum pump and sent to a RTO for control of H₂S, methane, benzene, and other trace gases. Exhaust from the RTO is routed to a wet scrubber before being released to the atmosphere. Figure 2-10 shows the Process Flow Diagram for the Amended Project. A heat balance diagram for the Amended Project is not provided with this AP because it contains proprietary, confidential data. The heat balance diagram will be provided to the CEC upon request on a confidential basis.

2.5.2.1 Resource Production Facility

The fundamental purpose of the RPF is to extract geothermal brine, produce steam to power the turbine, and re-inject the spent geothermal brine and cooling tower blowdown. There are three different types of wells associated with the RPF: 1) production wells that are used to extract geothermal fluids; 2) injection wells that are used to inject geothermal brine after heat and steam have been extracted; and 3) plant wells that are used as injection wells dedicated to excess condensate mixed with cooling tower blowdown or aerated brine from the brine ponds. In addition to the production and injection wells, there are numerous processing components associated with the RPF. The major subsystems of the RPF are listed below and described in the following sections.

- Production wells and pipelines,
- Steam handling system,
- Brine injection system,
- Plant injection wells,
- Brine ponds, and
- PTU.

Production Wells and Pipelines

As part of the Amended Project, there are a total of nine production wells (three for each 53 MW unit on three separate well pads). Each production well will be drilled to a depth of approximately 7,400 feet, with casing set at a depth of approximately 2,500 feet. Actual depths will vary somewhat based on geology encountered during the construction of the production wells. Numerous factors were considered in selecting well locations, including efficient utilization of the geothermal resource, minimizing interference with existing production wells, and environmental constraints. The proposed production wells are spatially separated from injection wells to optimize field development and reservoir management. The well pads will be equipped with production line warm-up headers used to startup the production wells after they are drilled and for facility startups. During initial startup, the warm-up headers will feed into a warm-up line that discharges into a PTU located near the brine pond. For each of the three power plants, there will be one PTU and one brine pond. Liquid from each PTU will discharge into the brine pond. Each production well will have an average flow rate of approximately 2.5 million pounds of brine per hour at wellhead pressures of 375 to 425 pounds per square inch (psi) and at temperatures of 450 degrees Fahrenheit (°F) to 480°F.

Aboveground piping will be constructed at each power plant to connect the production wells with the individual RPFs. The piping will be insulated so as to minimize radiant heat loss. Because the production piping will be operated at near well-head temperatures (i.e., 450°F to 480°F), a major design consideration is thermal expansion. The piping will therefore be designed by qualified mechanical engineers and constructed so as to accommodate the anticipated thermal expansion. Similar consideration will be applied to the piping connecting the RPF to the injection wells. Production and injection headers will be constructed of 2507 super-duplex stainless steel alloy piping, 24 to 30 inches in diameter. The alloy piping from the wellheads each have isolation valves on both sides of an emergency shutoff valve. They each feed into a single pipeline header equipped with a header isolation valve. Each production well is instrumented with pressure and temperature sensors remotely monitored in the Project's central control room. Production headers are designed for a pressure rating of 600 psi, and injection headers are designed for a code pressure rating of 300 psi. The super-duplex alloy piping has been successfully deployed in numerous CalEnergy operating geothermal plants. For personnel protection and to prevent energy loss, the pipelines will be wrapped with four inches of insulation, and the insulation will be protected with an aluminum jacket. Flanges and valves will be wrapped with removable insulating jackets.

Reservoir properties of the hyper-saline brine in the Amended Project area are expected to have downhole temperatures of 550 to 600°F and a total dissolved solids (TDS) content of approximately of 23.5 percent by weight, with NCGs of 0.212 percent by weight. Dissolved solids consist primarily of sodium chloride, calcium chloride, and potassium chloride salts. There are also significant amounts of zinc, manganese, iron, and silica dissolved in the brine. The major component of the NCG is carbon dioxide (CO₂). There are

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a wide variety of other components in the brine, although other components each represent less than 0.3 percent by weight. Production brine will be piped through 13 ³/₈-inch titanium wellbore piping, with 16-inch wellhead piping and valves. Each well will produce an average of 2.5 million pounds per hour of a mixture of steam vapor, NCG, and brine in a two-phase flow. There is no need for a downhole pump as the geothermal brine flows to the surface under natural reservoir pressure. Expected properties of the produced fluid are as follows:

- 235,000 parts per million by weight (ppmw) TDS;
- 0.212 percent by weight NCG;
- Total enthalpy: 403 British thermal unit per pound;
- Reservoir Temperature Range: 550°F to 600°F; and
- Wellhead Temperature Range: 450°F to 550°F.

The anticipated chemical composition of the produced fluids based on CE Generation operating experience is shown in Table 2-4.

Table 2-4 Anticipated Chemical Composition of Produced Fluids

Constituent	Concentration ppm	Constituent	Concentration ppm
Beryllium (Be+2)	ND ¹	Barium (Ba+2)	177
Ammonium (NH4+)	369	Mercury (Hg+2)	ND1
Sodium (Na+)	50,169	Lead (Pb+2)	79
Magnesium (Mg+2)	39	Bicarbonate (HCO-3)	69
Aluminum (Al+3)	ND ^{1,2}	Nitrate (NO-3)	ND1
Potassium (K+)	12,784	Fluorine (F-)	20
Calcium (Ca+2)	24,584	Sulfur Monoxide (SO-2)	98
Chromium (Cr+3)	ND ¹	Chlorine (Cl-)	137,670
Manganese (Mn+2)	983	Arsenate (AsO4-3)	20
Iron (Fe+2)	1,180	Selenate (SeO4-2)	ND1
Nickel (Ni+2)	ND1	Bromine (Br-)	89
Copper (Cu+2)	4	Iodine (I-)	10
Zinc (Zn+2)	320	Silicon Dioxide (SiO2)	433
Rubidium (Rb+)	69	Carbon Dioxide (CO2)	3,309
Strontium (Sr+2)	443	Boric Acid (B[OH]3)	1,800
Silver (Ag+)	ND ¹	Hydrogen Sulfide (H2S)	15
Cadmium (Cd+2)	1	Ammonia (NH3)	59
Antimony (Sb+3)	1	Methane (CH4)	10
Cesium (Cs+)	12	Total Dissolved Solids (TDS)	235,000

Table 2-4 Anticipated Chemical Composition of Produced Fluids

Constituent	Concentration ppm	Constituent	Concentration ppm
ND= Not Detected ¹ . Several of the constituents listed as ND have been detected in brine from this resource, although the quantities may be present at trace levels. ² . Aluminum is known to be present in measureable quantities in brine from this resource. Source: 2003 AFC for SSU6			

Steam Handling System

The common production header discharges the two-phase brine flow into one HP steam/liquid separator for each of the three RPFs. In the original project, there were six steam liquid separators, two each for high pressure, standard pressure, and low-pressure conditions. In the Amended Project, there will be a total of three HP steam liquid separators (one per power plant). Production brine is discharged to the HP separator to separate the process steam from the brine and reduce its temperature and pressure prior to discharging the spent brine to the injection wells. The HP separator will be fabricated from explosion clad Inconel 625 plates and internals, with $\frac{3}{16}$ inch minimum wall thickness. The HP separator size and internal cluster will be the same as the Applicant's Unit 4 Separator V-4304, which has been in successful operation since 1996. Each unit will be 12 feet in diameter, and 54 feet long, with elliptical heads.

Each separator vessel will also be equipped with a vortex tube cluster. The primary function of the vortex tube cluster is to remove liquid and particles from the gas stream and help separate the two different density liquids (brine and steam). HP steam is directed from the separator through a carbon steel pipeline to an HP scrubber and an HP demister in series, then into the HP inlets of the steam turbine.

The HP scrubber removes chloride contamination from the steam to prevent damage to the steam turbine and other downstream equipment. The scrubbing solution is periodically discharged to the brine ponds to prevent sodium chloride buildup in the scrubber. The HP demister is a device often fitted to vapor liquid separator vessels to enhance the removal of liquid droplets entrained in the vapor stream. The demister aggregates the mist into droplets that are heavy enough to separate from the vapor stream. An overpressure venting system is included for system protection, with vented fluids directed through the rock muffler to the brine pond. The process configuration and size of equipment is identical to CalEnergy Unit 4 which has been processing geothermal brine since 1996.

The geothermal fluid contains NCGs which are dissolved in the fluid while at reservoir pressures. When pressure is relieved while traveling to and within the steam handling system, the NCGs are released from the brine. The NCGs average 0.212 percent by weight of the total flow. The primary constituent of NCG is CO₂, with smaller amounts of H₂S, methane, ammonia, benzene, toluene and xylene. Some heavy metals (e.g. arsenic, mercury) may become entrained in the steam phase as well. The NCGs separate from the steam phase and are processed and subsequently treated in the PGF via an RTO and wet scrubber system.

Brine Injection System

For each power plant, there will be a total of three brine injection wells situated on three new brine injection well pads. Injection well pads will be located to the south, southeast, and east approximately 8,000 to 10,000 feet from the plant site south of the main blind fault, as shown in Figure 2-1. Injection wells will be drilled to an average depth 8,725 feet. They will be cased with titanium casing to a depth where static subsurface temperatures are above 500°F and where rocks are stable. Actual depths will vary somewhat based on the geology encountered during the construction of the injection wells. The injection wells are planned as low-angle slant or S-shaped well courses in order to minimize displacement from the wellhead and enhance the interception of fractures of multiple orientations.

The brine injection wells will have an average injection rate of approximately 1.9 million pounds per hour of brine at a temperature of approximately 400°F to 420°F. Use of the single flash technology for the Amended Project allows for maintaining an elevated injection temperature which, in turn, mitigates solids precipitation and allows the three power plants to be operated without producing large amounts of brine solids; this is a significant difference from the original SSU6 project, which would have produced up to 200 tons per day of brine solids that would have required offsite disposal.

The brine injection system operates as follows: brine from the HP separator is pumped from the RPF to the remote injection well pads via an aboveground pipeline. There will be one aboveground injection pipeline per power plant. Two in-series booster pumps and two main injection pump trains (each capable of 100 percent total brine flow capacity) deliver the brine to the injection wells through a highly corrosion resistant alloy injection pipeline. Each of the three, 30-inch diameter injection pipelines will be fabricated from either 25Cr duplex alloy or 2205 duplex mechanical clad carbon steel to resist the slightly acidified, corrosive injection brine. The selection of material of construction was based on successful operation of the acidified brine header made of carbon steel pipe lined with duplex alloy 2205 on other CE Obsidian operating plants. A similar brine injection header was installed in 2002 at CE Obsidian Region 2 and has been performing without any corrosion problems since that time. Each injection well is remotely metered for pressure, temperature, and flow rate. Brine injection will take place in accordance with California Division of Oil, Gas, and Geothermal Resources (CDOGGR) regulations.

The selection of type and size of injection pumps was based on currently operating Unit 4 transfer pumps and CE Obsidian Unit 5 injection pumps. The brine injection system pumping station will be equipped with two sets of 100 percent pump trains. Each pump train consists of a booster pump and a main injection pump in series. The pumps will be designed for the required pressure once the post-drilling testing is completed. The pumping station will include a local control panel, while main control for this pumping station will be located in the shared control building.

Plant Injection Wells

In addition to the brine injection wells, a total of four additional injection wells will be dedicated to managing excess condensate and cooling tower blowdown ("condensate wells") and aerated brine. Two injection wells for aerated brine (brine that has been exposed to the atmosphere) will be constructed for the management of brine pond liquids, and two separate injection wells, known as "plant" injection wells, will be dedicated to the management of excess condensate and cooling tower blowdown. The two plant condensate injection wells and two aerated brine injection wells will be located within the plant site. Constituents of the cooling tower blowdown and injected brine are provided in Table 2-5.

Table 2-5 Cooling Tower Blowdown and Injected Process Brine Fluid Characterization

Constituent	Cooling Tower Blowdown1 mg/l	Aerated Brine2 mg/l	Constituent	Cooling Tower Blowdown1 mg/l	Aerated Brine mg/l
Lithium	ND	253.3	Barium	0.21	240.0
Beryllium	ND	0.01	Mercury	ND	0.004
Ammonia	900	500.0	Lead	ND	106.7
Sodium	197	68,024.0	Bicarbonate	NA	93.3
Magnesium	46	53.3	Nitrate	1.26	0.0
Aluminum	0.42	0.3	Fluoride	0.88	26.7
Potassium	7.3	17,333.3	Sulfate	3,132	133.3
Calcium	121	33,333.3	Chloride	210	186,666.7
Chromium	ND	0.004	Arsenic	0.53	14.7
Manganese	0.13	1,333.3	Selenium	ND	0.007
Iron	0.21	1,600.0	Bromide	ND	120
Nickel	ND	0.03	Iodine	NA	13.3
Copper	0.06	5.3	Silica	13	586.7
Zinc	0.05	433.3	CO2	NA	2,006.7
Rubidium	NA	93.3	Boron	399	426.58
Strontium	2.3	600.0	Sulfide	11.76	20.1
Silver	ND	0.3	Benzene	0.01	0.003
Cadmium	ND	1.7	TDS	7,952	316,063.4
Antimony	ND	1.1	pH	6.60	4 to 7
Cesium	NA	16.7	Barium	0.21	240.0
mg/l = milligrams per liter ND – Not detected NA = Not analyzed Source: WorleyParsons, 2008 Data presented is from original SSU6 project; data not yet developed for Amended Project.					

Brine Ponds

Each production well pad will have a dedicated brine pond. This structure is a large concrete-lined basin that is sized to accommodate up to six hours of brine released under upset conditions, plus two feet of freeboard. Monitoring wells are located adjacent to the brine pond to comply with regional groundwater regulations. The brine pond will also be used as mud sump to dispose of drilling wastes during initial well construction and for well re-work activities (see Sections 2.5.7.2 and 2.5.8.5 for more details). During operational upset conditions, HP separator brine and condensate from the steam vented to the rock muffler would be directed to this pond for temporary containment. This “aerated brine” (e.g.- because the brine has been exposed to the air) will be managed by pumping it to one of two dedicated aerated brine wells located

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on the main plant site for injection. If necessary to accomplish injection, the brine may be diluted with water so that it is able to be pumped and flows properly in the formation underlying the site.

Although the Amended Project is expected to generate substantially fewer solids than the original project, a small amount of solids are expected precipitate out of the brine in the brine pond due to the low temperature (relative to reservoir temperatures) and the fact that some steam will flash off the produced brine, thus concentrating the dissolved salts. The rate of accumulation is not known, but is expected to be only a few tons per year. The brine pond solids will be removed annually, then dewatered in a filter press and transported by a licensed transporter to an appropriately permitted offsite facility.

The brine pond will also collect brine from production wells venting into the PTU during startup. The aerated brine will be pumped into one of two aerated brine injection wells. Flowing brine under the previously described startup conditions should be infrequent because the Project will be operated as a base load facility.

Production Test Unit

Each RPF will have a PTU, which is used for well startup and warm-up. The PTU is an atmospheric flash tank into which brine is flowed during production well testing and startups until a sufficiently high temperature is reached. Warm up of the production well system is achieved at around 15 to 30 percent of the maximum production well capacity and only one well is started up at a time. Cold startup for each production well can take from four to eight hours. The brine flow is then directed to the HP separator for steam production to feed the PGF. Brine passing through the PTU is then discharged to the brine pond. The PTU physical height is approximately 50 feet from ground level to top of the vent stack. The flash tank inside diameter is 180 inches with a vent stack of 90 inches inside diameter. The PTU will be designed for one million pounds per hour (lbs/hr) of brine flow with a 20 percent flash rate (i.e., 200,000 lbs/hr of steam flow).

2.5.2.2 Power Generation Facility

This section describes the major energy conversion components of the proposed project which are included in each of the three identical PGFs. Each PGF includes the following components:

- STG – single-casing, single pressure, exhaust flow condensing turbine;
- Condenser - shell-and-tube type heat exchanger (part of the power cycle heat rejection system);
- One 5-cell cooling tower (part of the power cycle heat rejection system);
- One RTO – air emission control system;
- One rock muffler/pressure relief vent system;
- One 1.5-MW emergency generator, diesel fueled, 4,160 volts (V);
- One 1.0-MW emergency generator, diesel fueled, 480V;
- One 200-horsepower 2,400 gallons per minute (gpm) emergency fire water pump, diesel-fueled; and
- One 25-horsepower diesel “jockey” pump.

Each PGF also includes several power distribution centers. Common facilities shared between the three PGFs include a 230-kV switchyard, a control building, a service water pond, and other support facilities. The major components are described below.

Steam Turbine Generator

The PGF includes a single cased, single-pressure, down exhaust condensing turbine. Geothermal steam from the RPF will be the only steam source used by the STG. Each turbine generator set will consist of a condensing turbine generator with HP steam entry pressure. Nominal turbine inlet pressure is 250 pounds per square inch absolute. The STG is nominally rated at 53 MW (net). Heat rejection for the steam turbines will be accomplished with a condenser and counterflow cooling tower. The turbine is directly coupled to a totally enclosed water and air-cooled synchronous-type generator. The generator is expected to have a design rating of 75 megavolt amperes at a power factor of 0.90 lagging. The turbine-generator will be fully equipped with auxiliary systems for turbine control and speed protection, lubricating oil, gland sealing, generator excitation, and cooling.

Condenser

The condenser is a stainless steel shell-and-tube type heat exchanger designed to operate under vacuum. It receives exhaust steam from the LP section of the STG and condenses it to liquid for return to the cooling tower. During base load operation at design ambient conditions (83.7°F wet bulb temp, 105°F dry bulb temp), the condenser is expected to operate at a vacuum pressure of 2.34-inches mercury (atmospheric) and produce condensate flow of 804,935 lbs/hr. Heat is absorbed by the circulating water from the cooling tower, which warms by approximately 20°F at peak load. The warmed circulating water exits the condenser and returns to the cooling tower.

Counterflow Cooling Tower

Each PGF will have a dedicated five-cell, induced draft cooling tower. Each cooling tower will have three 50-percent-capacity, vertical, wet-pit circulating water pumps to circulate water between the cooling tower and condenser and two 100-percent-capacity, vertical, wet-pit auxiliary water pumps that will circulate water between the cooling tower and the plant auxiliary cooling loads. Each cooling tower has an inlet circulating water flowrate of 89,112 gpm and will be equipped with a high efficiency mist eliminator to minimize drift losses to no more than 0.0005 percent of design flow rate to reduce particulate matter (PM10) emissions.

The circulating water is distributed among multiple cells of the cooling tower, where it cascades downward through each cell and then collects in the cooling tower basin. The circulating water is cooled through evaporation. The cooled circulating water is pumped from the cooling tower basin back to the condenser. As discussed in Section 2.5.4.3, the circulating water will be treated to minimize corrosion and to inhibit biological growth. Makeup water to the cooling tower is supplied primarily from steam condensate, and secondarily from the nearby IID canal. Additional Amended Project water supply details are provided in Section 2.5.4.3. The ambient wet bulb and dry bulb temperatures, which vary during the course of a year, impact the cooling capacity of the cooling tower. To ensure that the condenser can operate efficiently to condense the steam and maintain a vacuum so that the STGs operate at peak efficiency, the cooling towers will be designed with sufficient capacity for ambient temperature during the summer peaks.

Closed-loop Auxiliary Cooling Water System

The closed loop auxiliary cooling water system will be filled with a coolant such as a mixture of glycol and water. The coolant is circulated through a closed loop system to cool auxiliary equipment including the STG lubrication oil coolers, air compressor aftercoolers, and steam cycle sample coolers. The coolant absorbs heat from the various equipment items being cooled and is, in turn, cooled by non-contact heat exchange with a branch of the circulating water system.

Recuperative Thermal Oxidizer

Air emissions control for each PGF will be accomplished using a RTO and sulfur dioxide (SO₂) scrubber. Unlike the air emissions control system for the original project, which would have generated solid sulfur waste at a rate of two tons per day, hazardous benzene-contaminated waste, and the venting of methane emissions to the atmosphere, the RTO will not generate any solid sulfur or benzene-contaminated hazardous wastes. A more detailed description of the proposed air emissions control system is presented below.

There will be a total of three RTOs installed as part of the Amended Project, one at each PGF. NCGs are evacuated from the condenser heat exchanger using a vacuum pump and routed to the RTO for control of H₂S, methane, benzene and other trace gas emissions. The RTO is a direct oxidizing process that allows for simultaneous destruction of benzene and H₂S and other combustible constituents present in the NCG in a compact unit that is easy to operate and maintain. The ammonia is expected to pass through the RTO without combusting. The ammonia is expected to pass through the RTO without oxidizing. The RTO unit burns a propane-air mixture (3 million British thermal units per hour [MMBtu/hr] maximum capacity, but heat demand modulates as necessary) to maintain the temperature of the oxidation chamber at approximately 1,500°F. When the appropriate temperature is reached, vacuum, created by a downstream vacuum blower, causes the process stream and outside air to enter the oxidizing chamber. Flammable gases in the process stream including methane, benzene, H₂S, and hydrogen are oxidized. During this process, benzene and methane are converted into CO₂ and water while H₂S is oxidized to SO₂, with a small fraction oxidizing to sulfur trioxide (SO₃). Hydrogen is oxidized to water vapor. The control efficiency of the RTO is expected to be 95 percent or more for most constituents. Following oxidizing, the gas stream enters a bypass that routes the 1,500°F oxidized gases to a heat exchanger connected to the process stream inlet plenum. Heat is removed from the hot gas, lowering its temperature to approximately 700°F. Heat removed from the hot gas is used to increase the inlet stream to a temperature of 800°F prior to entry into the oxidizing chamber, thus reducing the propane required to sustain the operating temperature in the oxidation chamber. After releasing heat to the inlet process stream, the cooled gas is routed to a water quench tower to further reduce its temperature prior to entry into the SO₂ scrubber.

Following the RTO, the exhaust gas enters a quench tower in which the temperatures of the gases are lowered using water injection. In the tower, some portion of the SO₂ and SO₃ are expected to form sulfurous and sulfuric acids in water which will in turn react with the ammonia to form ammonium sulfate. The control efficiency for ammonia in the quench tower is not known. The quench water is periodically discharged to the cooling tower basin.

Following the RTO and quench tower, the gas stream enters a packed-bed SO₂ scrubber where a sodium hydroxide (NaOH) solution is introduced. The NaOH reacts with the SO₂ and acid gas formed by the oxidation process to form a mixture of sulfates and sulfites in aqueous solution. The scrubbing solution is

periodically discharged to prevent sulfate and sulfite buildup in the scrubber tower. The sodium sulfite/sulfate solution created by operation of the SO₂ scrubber is of a sufficiently small volume that it can be safely introduced into the cooling tower basin for disposal. The SO₂ scrubber is equipped with a mist eliminator to reduce drift and minimize PM10 emissions. The SO₂ scrubber is followed by a mercury abatement system. This is a proprietary system which will form a non-hazardous amalgam of mercury and selenium. The treated exhaust then vents to the atmosphere through a stack.

Steam Relief System (“Rock Muffler”)

The steam relief system (“rock muffler”) is a system used during upset conditions when it is necessary to vent steam to the atmosphere. Steam venting occurs during plant startups to warm up the steam piping and during upset conditions associated with plant trips and other controlled venting events. The proposed rock muffler vent system is a reinforced-concrete rectangular structure with dual chambers, to be designed to allow internal inspection of the diffuser at the bottom chamber through a manway into the vent chamber. The rock muffler’s dimensions are 16 feet wide, 20 feet long, and 24 feet high and the wall thickness is approximately one foot. The upper chamber is filled with volcanic rocks that will substantially reduce the venting noise. This design concept has been permitted and successfully deployed at CE Generation’s existing Unit 5 and other geothermal locations.

During these upset events, steam bypasses the turbine and is rerouted to the rock muffler for venting to the atmosphere. The rock muffler can receive the flow of steam generated from 6.3 million pounds per hour of geothermal brine. Depending on the source of the plant trips, venting may be performed for several hours, several times per year. During a scheduled shut down, the venting process normally requires one shift (12 hours) to bring the plant to a complete shutdown. During startups, the steam flow to the rock muffler gradually rises from one well production to the full capacity of three wells. The Amended Project is anticipated to start up five times per year, one “cold start” and four “warm starts”. It is anticipated that four stops (and thus four warm starts) per turbine will occur per year due to short-term outages. Trips and emergency shutdowns caused by the plant are expected to last less than 12 hours per event.

The recycle option of shunting brine directly from the production wells into the injection wells is not considered a feasible option. Production brine is run through the HP separator to reduce the temperature and pressure prior to discharge to the injection wells with or without the injection pumps. Running the production brine through the HP separator will always makes steam and the steam is vented through the rock muffler. Condensate from the rock muffler will be routed to the brine pond rather than the cooling tower due to the potentially high concentration of chlorides in the condensate.

Diesel Fueled Emergency Generators and Fire water Pumps

There are two diesel-fueled emergency generators and one diesel-fueled emergency fire water pump provided for each PGF. They include one 1.5-MW, 4,160V emergency generator, one 1.0-MW, 480V, emergency generator, and one 200-horsepower, 2,400-gpm emergency fire water pump.

PGF Shared Components

The three PGFs will share the following common process equipment and components, as listed below. A more detailed discussion of some of these common components is included in Section 2.5.3 and Section 2.5.5.

<u>Shared Component</u>	<u>Description / Function</u>
<ul style="list-style-type: none">• Electrical control building	Control functions for all functions of the Project.
<ul style="list-style-type: none">• Storm water runoff detention basin	Designed for retention of storm water expected from a 100-year storm event, plus freeboard. Capacity of ~3,680,000 gallons.
<ul style="list-style-type: none">• Fire water pond	Capacity of ~646,000 gallons.
<ul style="list-style-type: none">• Condensate storage pond	Stores excess condensate from the PGF for use in other plant water demands such as the steam scrubbing water, quench water for exhaust from the RTO, and pump seal flush water. Capacity of ~862,000 gallons.
<ul style="list-style-type: none">• Raw water pond	The ~1,100,000-gallon service water pond is a lined earthen structure that will hold IID canal water to supply facility service water needs.
<ul style="list-style-type: none">• Paved parking area	Employee and contractor parking.
<ul style="list-style-type: none">• RO System	Used for purifying service water from the IID canal for use as service water and for wash rooms, toilets, etc.

2.5.3 Plant Electrical System

The major electrical systems and equipment proposed for the Project are described in this section. Almost all of the power produced will be delivered to the regional grid through the Project's interconnection with the IID transmission system (the Project's transmission system is discussed in Section 2.6). Approximately 10 percent of the Project's gross electrical output (18 MW) will be used onsite for plant auxiliaries such as pumps, cooling tower fans, control systems, and general facility loads including lighting and heating, ventilation, and air conditioning (HVAC). Some of the power needed for onsite uses will be converted from alternating current (AC) to direct current (DC) for power plant control systems and emergency backup systems. The descriptions of the major electrical systems and equipment provided in the following subsections reflect AC power unless otherwise noted. An overall one-line diagram of the major electrical systems is presented in Figure 2-11. Note that the one-line diagram shows the generator output to be 65 MW. This is the maximum capacity of the proposed generator under ideal conditions; the nominal generator output is 59 MW.

2.5.3.1 AC Power Transmission

Power will be produced at the facility by the 13.8-kV generator. The output of the generator is connected by an isolated-phase bus to a two-winding, oil-filled (13.8 to 230 kV) STG main step-up transformer. Surge arrestors around the high-voltage bushings protect the transformer in the 230-kV system from lightning strikes or other disturbances. The transformer is set on a concrete pad with spill containment. A fire protection system is also provided. The high voltage side of the main step-up transformer is connected to a 230-kV switchyard using 230-kV-rated high-voltage circuit breakers with associated disconnect switches.

2.5.3.2 AC Power Distribution

Plant power will be provided from the switchyard through the main step-up transformer and unit auxiliary transformers. Two auxiliary transformers will be rated to supply plant startup and normal operating power

requirements. Each transformer will be sized for half of the installed station auxiliary loads. The unit auxiliary transformers will be connected by an insulated cable from the main isolated phase bus. Each unit auxiliary transformer will be provided with a neutral ground resistor to limit ground fault current. Ground fault relaying will be provided on the 4,160V secondary neutral.

The 4,160V switchgear will provide power to the load center (LC) transformers and the 4,160V emergency bus. Medium voltage motors will be supplied from the 4,160V system using motor controllers. The LC transformers (480V, 3-phase, 60-hertz [Hz], outdoor, oil-filled) will provide power to the 480V motor control centers (MCCs). The MCCs distribute power to the 480V motors, 480V power panels and to other 480V loads. The neutral of the 480V system is grounded with individual feeder ground fault detection. The 480V MCCs and/or 480V power panels provide power to 480-120/208V dry-type power and lighting transformers.

2.5.3.3 Startup Power

The plant is not black-start capable. Electric power from the utility system must be available to bring the facility on-line. During normal startup, power required for auxiliaries will be provided from the local utility (IID) through the main step-up transformer, then through the unit auxiliary transformers.

2.5.3.4 Electrical System for Plant Auxiliaries

Power for plant auxiliaries is supplied at 4,160V from three auxiliary transformers. The 13.8-kV bus of each STG is provided with a tap connection to a 13.8-kV/4,160V oil-filled, step-down, auxiliary transformer. The 4,160V side of each transformer is connected to 4,160V switchgear. Each STG is provided with a 13.8-kV generator breaker located between the generator and the tap connection. This configuration allows power for plant auxiliaries to be supplied from the plant switchyard regardless of whether the STGs are online or offline. The auxiliary transformers rest on concrete containment pads designed to contain the transformer oil in the event of a leak or spill.

The 4,160V switchgear distributes power to the plant's 4,160V motors and to the 4,160/480V transformers. The low voltage side of the 4,160/480V transformers is connected to 480V switchgear. The 480V switchgear distributes power to the plant's large 480V loads and to 480V MCCs. The MCCs distribute power to the plant's intermediate 480V loads and to power panels serving small 480 V loads. The MCCs also distribute power to 480/277V isolation transformers serving 277V single-phase loads (i.e. lighting) and to 480/208/120 transformers serving 208V and 120V loads.

2.5.3.5 DC Power Supply

The DC power supply system consists of two battery banks, each with a 125VDC full-capacity battery charger, metering, ground detector, and distribution panel. One 125VDC battery will be dedicated to the essential service (uninterruptible power supply) system. The other 125VDC battery will feed all other station DC loads. The station 125VDC system supplies control power to the generator circuit breakers, protection relay panels, 4,160V switchgear, DC lube oil pump, and other critical control circuits. Under normal operating conditions, the battery chargers will supply DC power to the DC loads. The battery chargers will receive 480V, 3-phase AC power from one of the MCCs and continuously charge the batteries while the batteries supply power to the DC loads. The 125VDC system will be an ungrounded system, and a ground detector will monitor grounds on the DC power supply system.

2.5.3.6 Essential Service AC

The facility essential service 120VAC, single-phase, 60-Hz power source will supply AC power to essential Distributed Control System (DCS) loads and to unit protection and safety systems that require uninterruptible AC power. The essential service AC system and its DC power supply system are both designed to supply critical safety and unit protection control circuits. The essential service AC system consists of one full-capacity charger and inverter, one dedicated 125VDC battery system, a solid-state transfer switch, a manual bypass switch, an alternate source transformer and voltage regulator, and AC panel boards.

When the normal 480V power source to the essential service AC system fails, the dedicated 125VDC battery powers the inverter to the panel boards. The solid-state transfer switch continuously monitors both the inverter output and the alternate AC source. The transfer switch automatically transfers essential AC loads without interruption from the inverter output to the alternate source upon loss of the inverter output. A manual bypass switch isolates the inverter-static transfer switch for testing and maintenance without interruption to the essential service AC loads. Recharging of a battery occurs when 480V power returns from the AC power supply (480 V) system. The rate of charge depends on the characteristics of the battery, battery charger, and the connected DC load during charging; however, the maximum recharge time is eight hours.

2.5.3.7 Emergency Power

In case of a total loss of auxiliary power, or in a situation when the utility system is out of service, emergency power for critical loads (brine injection pumps, air compressor, DC lube oil pump, turbine turning gear, emergency lighting, and other vital loads) will be supplied by the standby emergency generators. One 1.5 MW, 4,160V emergency diesel generator and one 1.0 MW, 480V emergency diesel generator will be installed for each PGF. These generators are sized to maintain reduced capacity operation of the RPF and critical loads associated with the PGF and common facilities. As these generators will be installed subsequent to January 2011, the associated diesel engines will meet U.S. Environmental Protection Agency Tier 4 emission standards.

2.5.3.8 Grounding and Lightning Protection

The electrical system is susceptible to ground faults, lightning, and switching surges that result in unit ground-potential rises. This constitutes a hazard to site personnel and electrical equipment. A grounding system provides an adequate path for dissipation of ground fault currents and minimizes the ground-potential rise. The station-grounding grid is designed with adequate capacity to dissipate heat from ground current under the most severe fault conditions in areas of high ground fault current concentration.

The grounding system consists of bare conductors installed below grade in a grid pattern. Each junction of the grid will be bonded together either by welding or by mechanical connectors. The grid spacing is such that safe voltage gradients will be maintained. Ground resistivity readings performed as part of the subsurface investigations will be used to determine the necessary number of ground rods and grid spacing to ensure safe step and touch potentials under fault conditions. Grounding cables will be brought from the ground grid to connect to building steel and non-energized metallic parts of electrical equipment. Isolated grounding conductors to the ground grid will be provided for sensitive control systems. Lightning protection

will be furnished for buildings and structures in accordance with National Fire Protection Association (NFPA) 78. Lightning protection for the switchyards will be in accordance with accepted industry practice.

2.5.4 Plant Auxiliary Systems

The following plant auxiliary systems control, protect, and support the Project and its operation. They include the fire protection system, automation and DCS, lighting system, cathodic and freeze protection system, service and instrument air systems, HVAC system, plumbing system, and sanitary sewer system.

2.5.4.1 Fire Protection

Fire protection systems are provided to limit personnel injury, property loss, and downtime resulting from a fire. The system will consist of an underground fire main and surface distribution equipment meeting NFPA codes. Equipment includes yard hydrants and hose houses, monitors around the perimeter of the cooling tower, automatic sprinklers for the STG and auxiliary equipment, automatic spray system for the main step-up transformer, and a complete fire detection and alarm system. The fire water supply and pumping system will provide an adequate quantity of fire-fighting water for anticipated fire scenarios.

The fire water pond will have a capacity of 646,272 gallons. In accordance with NFPA 24 standards, an underground 10-inch-diameter perimeter fire water piping loop will supply water to the cooling tower areas and the STG areas. Buried carbon steel pipe will be wrapped and externally coated to enhance corrosion resistance. Non-metallic pipe is permitted and may be used provided the design has taken into consideration surface loads on the aboveground area and settlement potential of the pipe. Several hydrants with hose stations, strategically located around the plant perimeter, will be connected to the header. Hydrant locations will allow full coverage of the protected areas with 75-foot-long hoses. Threaded connections will conform to local standards, and fire water monitors will be installed in the vicinity of the cooling towers to provide adequate coverage.

Post indicator valves will be located at various points along the fire water loop to permit shutdown of one section of the loop without decommissioning the entire loop. The STG lube oil system, including the turbine and generator bearings, will be protected with automatic sprinklers and/or water spray systems in accordance with NFPA 13 and NFPA 15. The main step-up transformer will be protected with an automatic water spray system in accordance with NFPA 15. Electrical equipment buildings will be monitored with an automatic smoke detection and alarm system. Local building fire alarms will be provided in accordance with NFPA 72 standards. All materials will be free of asbestos and will meet the fire and smoke rating requirements of NFPA 255 (p.2-31).

A fire protection control panel will be provided and installed in the control building. The fire protection control panel will monitor and alarm the entire fire protection system. The fire detection and monitoring systems will be designed and installed in accordance with NFPA 72D and 72E.

The fire protection system will have three pumps: a 2,500-gpm motor-driven fire water pump; a 2,400-gpm diesel engine-driven fire water pump that meets Tier 4 standards; and a 25-gpm motor-driven jockey pump. (Note: A jockey pump is a small pump connected to a fire sprinkler system and is intended to maintain pressure in the fire protection piping system to an artificially high level so that the operation of a single fire sprinkler will cause an appreciable pressure drop which will be easily sensed by the fire pump automatic controller, causing the fire pump to start. The jockey pump is essentially a portion of the fire pump's control

system.) These pumps will be mounted on an enclosed skid, with accessories, all conforming to NFPA 20. The enclosure will include a sprinkler system, louvers, space heaters, lights, exhaust fans, electrical distribution panel, and will conform to all applicable LORS.

In addition to the fixed fire protection system, portable CO₂ and dry chemical extinguishers will be located throughout the plant (including the switchgear rooms), with size, rating, and spacing in accordance with NFPA 10 standards. Handcart CO₂ extinguishers will also be provided in the turbine area as necessary for specific hazards.

2.5.4.2 Automation and Distributed Control System

The plant will be designed with a high degree of automation to reduce the required actions performed by operating personnel. Via subsystem automation and a DCS, the number of individual control switches and indicators that confront the operator will be greatly reduced. This will reduce the complexity and size of the main control room consoles and panels. A distributed control and information system consisting of a state-of-the-art, integrated microprocessor-based DCS will provide modulating control, digital control, and monitoring and indicating functions for operation of the proposed plant power island and offsite systems.

The DCS will provide for startup, shutdown, and control of plant operation limits, and will provide protection for the equipment. Interlock and logic systems will be provided with hardwired relays, the DCS, or programmable controllers. Process switches (pressure, temperature, level, etc.) used for protective functions will be connected directly to the DCS and the protective system. Plant operation will be controlled from LCD flat screen control consoles and auxiliary control panels located in the control room. The DCS will provide coordinated control among the STG and balance-of-plant equipment. The STG control systems will interface with the DCS via a data link and/or hardwired input/output devices. The balance of plant equipment will be monitored and controlled via the DCS. A sequence-of-events function will be an integral part of the DCS. Indication of process changes that warrant action (e.g., process alarms, etc.), or information that the operator in the control room should be made aware of (annunciation) will primarily be provided by the DCS. Major packaged subsystems (water treatment system, fire protection system, etc.) may have a local alarm system with a single trouble alarm to the control room. The DCS will perform the following functions and miscellaneous tasks:

- Perform analog and digital plant control functions to accommodate a consistent operator interface for controlling the power plant equipment,
- Monitor both analog and digital signals to provide the operator/engineer with access to the data around the network,
- Perform alarm monitoring in the main control room for the entire plant,
- Provide graphic displays for all systems and equipment, including electrical systems and controller faceplates,
- Provide data logging and reporting via displays and printed reports, and
- Provide long-term data storage of process history.

Local control panels or stations will be furnished where operator attention is required to set up a system for operation, or where the equipment requires intermittent attention during plant operation. Main control room

indication and control will only be duplicated for those variables critical to plant availability. Functionally distributed and redundant microprocessor-based subsystem controllers will communicate with the main control room via a redundant high-speed communications network. The communications network will provide unit-wide data access for centralized operation and engineering functions via flat screen LCD monitors. Remote input/output capability will be provided to allow the DCS to interface with remote equipment and to reduce the quantity of long cable runs.

2.5.4.3 Lighting System

Lighting on the Amended Project site will be limited to areas required for safety and security, will be directed on site to avoid backscatter, and will be shielded from public view to the extent practicable. All lighting that is not required to be on during nighttime hours will be controlled with sensors or switches operated so that lighting will remain on only when needed. Lighting will be provided in the following areas:

- Building interior, office, control, and maintenance areas;
- Building exterior entrances;
- Outdoor equipment platforms and walkways;
- Transformer areas;
- Power island perimeter roads;
- Parking areas; and
- Plant entrance.

Emergency lighting from DC battery packs will be provided in areas of normal personnel traffic to permit egress from the area in case of failure of the normal lighting system. In major control equipment areas and electrical distribution equipment areas, emergency lighting permits equipment operation to allow auxiliary power to be reestablished.

2.5.4.4 Cathodic Protection System

Cathodic protection systems will be installed to protect against electrochemical corrosion of underground metal piping and structures. Cathodic protection will be provided by an impressed current system, a sacrificial system, and/or protective coatings.

2.5.4.5 Service and Instrument Air Systems

The service air system supplies compressed air to hose connections located at intervals throughout the power plant. Compressors deliver compressed air at a regulated pressure to the service air-piping network. The instrument air system provides dry, filtered air to pneumatic operators and devices throughout the power plant. Air from the service air system is dried, filtered, and pressure regulated prior to delivery to the instrument air-piping network.

2.5.4.6 Heating Ventilation and Air Conditioning

The HVAC systems for the Amended Project will be similar to those provided in the original SSU6 project. The HVAC system will provide an acceptable environment for personnel comfort and equipment operation within the plant buildings. The HVAC system will be designed in accordance with the California Building Code (CBC) and the California Mechanical Code. Air conditioning in the control and administrative areas will maintain a suitable environment for plant personnel. If required for proper equipment operation, humidity control will be provided in the control room. Outside air ventilation systems will be provided for buildings where air conditioning is not required. Normally occupied plant areas, including toilet areas, will be supplied with fresh air in accordance with the CBC, American Association of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE Standard 62), and the California Code of Regulations (CCR).

2.5.4.7 Plumbing System

The plumbing system will supply potable water to fixtures and will collect and convey waste fluids to the waste collection system. Plant plumbing systems will be constructed in accordance with the California Plumbing Code and local and state regulations. Water will be provided from IID canal water and treated using reverse osmosis (RO). The treated water will be provided for use in control building restrooms, showers, etc.; bottled water will be provided in the control building for drinking. Safety showers, eyewash stations, and utility hose bibs will be provided at appropriate locations throughout the facility. Restrooms, sinks, water coolers, and floor drains will discharge to the onsite septic tank.

2.5.4.8 Sanitary Sewer System

Sanitary waste will be conveyed via an underground sewer system to a buried septic tank. Waste from the tank will be periodically pumped out. There will be no leach field. The system will be constructed in conformance with State and Imperial County sanitation regulations.

2.5.5 Water Supply and Use

The Amended Project's various water uses include makeup for the cooling towers to replace evaporative losses, make up water for scrubber operation, quench water for the emissions control system, potable water, fire protection water, acid dilution water for injection into the spent brine, and pump seals. Water balance diagrams corresponding to base load operation of one power plant at nominal operating conditions and at peak water draw conditions in Figures 2-12a and 2-12b.

2.5.5.1 Water Requirements

Approximately 95 percent of the water required by the Amended Project, on an annual average basis, is for cooling tower makeup to offset water lost through evaporation and blowdown. This requirement will be met by steam condensed from the brine except during conditions (e.g., hot summer days), when makeup water may be required to supplement the condensate. After powering the turbine at each PGF, the spent steam will be sent to the condenser and the steam condensate will then be routed to the cooling tower. Condensed steam will also be the source of scrubber makeup water and steam wash water, and will be the source of seal water for the mechanical pump seals. The Amended Project will store recovered condensate in one 861,696-gallon aboveground storage tank, shared by all three power blocks. The remainder of the water required for Project operation will be provided by IID from an agricultural canal. On an annual

average basis (most likely case), the quantity of water drawn from the IID canal will be approximately 100 gallons per minute per plant, or about 161 afy. Total water consumption all three plants will be approximately 483 afy for the most likely case. Usage rates will vary during the year and will be higher in the summer months, when the peak maximum flow rate could be as high as about 197 gpm per plant, or about 317 afy per plant (if the peak flow rate occurred year round), and 953 afy for the entire Amended Project. The facility is designed to minimize reliance on external sources of water supply for these process needs by using condensate to the greatest extent practicable. Because of this avoided agricultural water use, the net water use for the Amended Project will represent a total decrease of approximately 296 afy for the most likely case consumption estimates, and an increase of approximately 174 afy based on conservative consumption estimates. Actual water use likely will be less.

2.5.5.2 External Water Supply

As discussed above and shown in Figure 2-12b, the Amended Project will require up to 197 gpm for each plant (953 afy total for the Project) of IID canal water to supplement the condensate when operating at full plant load. The water will be for uses including but not limited to cooling tower make up, acid dilution, and scrubber operation. The IID canal water will also be used for fire water, equipment wash down, and for various non-potable applications in the control building and elsewhere in the facilities.

The connection point for the Project to the IID canal will be the Vail 4A Lateral, Gate 460 near the midpoint of the eastern plant site boundary along Boyle Road; Gate 459 will be reserved as an alternate delivery point. The supply pipeline will be a 500-foot-long, buried, 10-inch carbon steel pipeline. The expected concentration of constituents in the IID canal water supply is listed on Table 2-6.

Table 2-6 Expected Water Quality – IID Canal

Constituent	IID Canal Water (ppm)	Constituent	IID Canal Water (ppm)
Calcium	88	Ammonia-Nitrogen	ND
Magnesium	34	Aluminum	290
Sodium	140	Antimony	ND
Potassium	5.5	Arsenic	ND
Total alkalinity	150	Barium	130
Hydroxide	ND	Beryllium	ND
Carbonate	ND	Boron	190
Bicarbonate	180	Cadmium	ND
Chloride	120	Total Chromium	ND
Sulfate	320	Copper	39
Fluoride	0.6	Iron	230
Nitrate	1.0	Lead	ND
pH	8.1	Lithium	ND
TDS	750	Manganese	80

Table 2-6 Expected Water Quality – IID Canal

Constituent	IID Canal Water (ppm)	Constituent	IID Canal Water (ppm)
Bromide	0.12	Mercury	ND
CO ₂	2.9	Nickel	ND
Sulfide	ND	Selenium	ND
Benzene	ND	Total Silica	10
Ethyl benzene	ND	Silver	ND
Toluene	ND	Strontium	1,400
Xylenes	ND	Zinc	30
ND = Not Detected			
Source: E.S. Babcock, Laboratory Reference Number: A8J1807-03			

2.5.5.3 Water Treatment

The peak load (summer) water balance diagram presented in Figure 2-12b shows the plant's various water uses and water treatment processes. The raw water, circulating water, process water, and wash water all require onsite treatment and this treatment varies according to the quality required for each of these uses. The following subsections describe the plant water treatment processes.

Steam Condensate Treatment

The applicant has developed a chemical oxidation (Chem Ox) process that will be used for treatment of condensate prior to the use in the cooling tower. The Chem Ox system will oxidize H₂S found in the hot-well condensate into sulfates by the addition of air and an oxidant (hydrogen peroxide, bleach, or similar compound). The Chem Ox system uses direct injection of the oxidant to the condensate line using metering pumps to facilitate the oxidization process. A sparger will be added to the condensate line capable of delivering 2.4-cubic feet per minute air to the line to provide a source of oxygen. The oxidant will be stored in a 1,000-gallon storage tank. The byproduct of the oxidation process is a soluble sulfate salt that will remain dissolved in the condensate. The Chem Ox system is expected to have an overall H₂S control efficiency of 90 percent or more.

Excess condensate (i.e., not used in the cooling tower) will be routed to a ~860,000-gallon condensate storage pond and then sent to the plant injection well for reinjection into the formation.

Circulating (Cooling) Water Treatment

Steam condensate will be used as cooling tower makeup water. Water conditioning chemicals will be fed into the makeup water to minimize corrosion and to inhibit mineral scale formation and biofouling. To further inhibit mineral scale formation, an organic phosphate inhibitor solution may be fed into the circulating water system in an amount proportional to the circulating water flow. The inhibitor solution feed equipment also includes a bulk storage tank and metering pumps. To inhibit biofouling, sodium hypochlorite will be shock-fed into the circulating water system as a biocide. The sodium hypochlorite feed equipment includes a bulk

storage tank and metering pumps. Table 2-7 below presents the anticipated water quality characteristics of the circulating water.

Water Treatment for Domestic Uses

The Amended Project will use IID canal water processed in an RO system to provide water for domestic uses (e.g., showers, sinks, toilets). RO separation technology is used to remove dissolved impurities from water through the use of a semi-permeable membrane. RO technology involves the reversal of flow through a membrane from a high salinity, or concentrated solution to the high purity, or "permeate", stream on the opposite side of the membrane. Pressure is used as the driving force for the separation. As shown in the water balance diagram (see Figures 2-12a and 2-12b), 13 ppm of IID canal water processed in the RO system yields 10 gpm of potable water and three gpm of wastewater (known as "reject") that will be disposed via injection in the plant injection wells. The RO system will have a prefilter to remove sediment from the feedwater and will have a clean-in-place system that uses detergents and mild acids to periodically clean the RO membrane.

2.5.6 Plant Civil/Structural Features

The following subsections describe the civil/structural features of the Amended Project. All equipment will have seismic anchoring that meets or exceeds requirements for California Building Code Site Class D or F. As was the case for the original SSU6 project, the Applicant plans to use pile driving to provide the needed seismic anchoring.

2.5.6.1 General Plant Conditions

Flood Protection

The Imperial County General Plan indicates that the Project site is in an area inside the 100-year floodplain. The Project site is within Federal Emergency Management Agency (FEMA) Zone A, which is considered an area within the 100-year floodplain and Zone D, which is considered an undetermined, but possible, flood hazard zone (FEMA, 1984). The County requires a Development Permit for construction in the special flood hazard zone below minus 220 feet below sea level near the Salton Sea. To protect the Project site from flooding, the entire 160-acre site will be enclosed by a perimeter berm designed with two-to-one (horizontal to vertical) sloping sides. The berm on the north side of the plant site and on the northern half of the eastern and western sides of the site will be 24 feet wide at the top with side slopes of 2:1 (horizontal:vertical). The berm surrounding the rest of the plant will be 12 feet wide at the top side slopes of 2:1 (horizontal:vertical). This berm will protect the plant from flooding, and will be of adequate height to provide flood protection to an elevation of at least 220 feet below sea level in accordance with County flood control requirements. The average plant site elevation is approximately 225 feet below sea level; consequently, the top of the berm must be 220 feet below mean sea level.

The facility will be served by the road network as shown on Figure 2-1. As shown, the perimeter roads are located on top of the flood control berm. An asphalt-paved access road will be constructed between Boyle and Severe Road through the plant site. The control room parking lot and all in-plant roads will also be asphalt paved.

Site Drainage

Site drainage considerations for the original project and the Amended Project are very similar. The site is fairly level. The proposed site drainage will generally flow from the southeast corner to the northwest corner toward the storm water detention pond located in the northwestern are of the plant site (see Figure 2 -6). All buildings and equipment are constructed on foundations with the overall site grading scheme designed to route surface water around and away from equipment and buildings. Storm water flows will be directed to the storm water detention pond via ditches, swales, and culverts. The proposed storm water detention pond for the Amended Project is designed for three inches of precipitation in a 24-hour period (100-year storm conditions) and will be approximately 500 feet long by 225 feet wide by 3.5 feet deep and the sides will have a 2:1 (horizontal:vertical) side slope. The storm water detention pond will be an earthen structure. Storm water accumulated in the pond will either evaporate or infiltrate. In the event that another storm occurs prior to the rainfall from the first either evaporating or infiltrating, localized flooding could occur in the area of the detention pond; however, this would not affect the operation of the facility nor any of the equipment.

Spill containment areas and sumps subject to chemical spills will be routed to a diked area from which spilled liquids will be pumped out and disposed, and will not flow into the storm water collection system.

2.5.6.2 Resource Production Facility

The civil/structural features related to the major components of the RPFs are described below.

Offsite Production and Injection Piping

Production and injection headers will be constructed of 2507 super-duplex alloy piping, 24 to 30 inches in diameter. These will be supported on drilled-pier, cast-in-place foundations.

Wellhead Separators, Scrubbers, and Demisters

The wellhead separators, scrubbers, and demisters will be supported on reinforced concrete mats at grade.

Atmospheric Flash Tanks, Emergency Relief Tanks, and Steam Vent Tanks

The atmospheric flash tanks, emergency relief tanks, and steam vent tanks will each be supported by reinforced concrete or structural steel structures. These concrete structures will be supported on reinforced concrete mats.

Brine Ponds

Figures 2-13a and 2-13b depicts the plan, section, and detail of each of the three brine ponds within the plant site. The brine ponds are each approximately 620 feet by 42 feet by four feet deep. Each brine pond contains a surrounding 20-foot area for cleanout vehicle access with an entry ramp. The brine ponds are designed in accordance with Title 27 Division 2 of the CCR – Special Requirements for Surface Impoundments, and will be permitted through the RWQCB.

The brine ponds are of earthen construction, lined with the following layered liner materials, and include a built-in leak detection system:

- Geosynthetic clay liner – Bentofix Thermal Lock GCL;
- GSE HD – HDPE Geomembrane 80 mil;
- GSE HyperNet – HDPE Geonet 200 mil;
- GSE HD White Texture single side – HDPE Geomembrane 80 mil;
- 6-inch Compacted Soil; and
- 6-inch Fiber Reinforced Concrete.

Monitoring wells will be provided adjacent to the brine ponds to comply with Regional Water Quality Control Board (RWQCB) groundwater protection regulations. Six ground monitoring wells and one background well will be drilled and constructed around each brine pond.

Storage Tanks

There will be three hydrochloric acid storage tanks for each of the three brine injection well pad locations for a total of nine onsite acid storage tanks. Each injection well pad will have two 11,000-gallon concentrated hydrochloric acid tanks, and one 38,000-gallon diluted hydrochloric acid storage tank. The acid tanks will be of pre-fabricated, plastic, single-walled, cylindrical design. The tank foundations will be reinforced concrete mats. Each set of three acid tanks will be placed inside a spill containment structure.

Miscellaneous Containment Structures

A containment area will be constructed adjacent to each of the brine ponds for temporary operation of a trailer-mounted filter press that will be used to dewater brine solids. See Section 2.5.8.5 and Section 5.16, Waste Management for more details.

A containment area also will be constructed for pipe maintenance and de-scaling activities that include hydroblasting or sandblasting to prevent wastes generated from these activities from impacting the environment.

2.5.6.3 Power Generation Facility

The civil/structural features related to the major components of the PGFs are described below. All equipment will have seismic anchoring that meets or exceeds requirements for California Building Code Site Class D or F.

Steam Turbine Generator and Condenser

The STG will be mounted on a raised concrete pedestal supported by reinforced concrete mat foundation at grade. The condenser will be located under the steam turbine and will be supported by the mat foundation. For operation and maintenance access, platforms will be provided adjacent to the equipment.

Cooling Towers

The cooling towers will be supported and water contained by a reinforced concrete basin. The mat foundations for these devices will be installed over stabilized soil, if necessary (as determined by further geotechnical investigation and detailed foundation design).

Recuperative Thermal Oxidizers

The RTOs will be supported by reinforced concrete mat foundations.

Control Building and Power Distribution Center

The control building will be a single-story structure on a reinforced concrete slab. The control building will be approximately 85 feet by 150 feet by 16 feet tall. The control building houses the facility control room, offices, kitchenette, electrical room, and toilet facilities. The power distribution centers will be a pre-engineered, one-story-high metal building supported several feet above grade and above the DCS field modules on reinforced concrete piers to provide cable access beneath the structures. The power distribution centers will house electrical switchgear and MCC. The power distribution centers will be approximately 16 feet by 32 feet by 16 feet tall. The control building and power distribution centers will be provided with HVAC equipment as needed for equipment and personnel.

Yard Ponds

The water storage structures are ponds, including one condensate storage pond (~862,000-gallon capacity), one fire water pond (~646,000-gallon capacity), and a raw or “service” water storage pond (1,077,120-gallon capacity), in a common rectangular, reinforced concrete structure. The 360-foot-long by 120-foot-wide by 10-foot-deep common storage pond will have 12-inch-thick walls and floor thicknesses and a 12 inch toe around the perimeter walls, with a two-foot freeboard. The pond will be supported on a suitable foundation consisting of a reinforced concrete slab on a reinforced concrete mat.

As discussed in Section 2.5.8.4 (Table 2-8), there will be a variety of chemical storage tanks used at the PGF. The tanks will be of pre-fabricated plastic or steel tanks, single-walled, cylindrical design. The tank foundations will be reinforced concrete mats. Tanks will be installed inside spill containment structures. Tank foundations and piping connections will be designed to appropriate standards for their contents and to CBC Site Class D or F earthquake requirements.

2.5.7 Project Construction

The overall construction schedule for the Amended Project from issuance of the Limited Notice to Proceed (Procurement of Major Materials) to final Construction Site Cleanup and Demobilization is expected to take approximately 53 months for all three Black Rock units, with field mobilization occurring after seven months of offsite engineering design work (see Figure 2-14). It is anticipated that the first power plant will become operational in approximately 32 months. The second and third power plants will become operational in roughly 9 to 10-month intervals following completion of the first power plant. Construction of the production and injection wells will be initiated approximately seven months following the Notice to Proceed (NTP) and accomplished concurrently with the construction of the first power plant. Construction of all wells and associated piping is expected to take 24 to 30 months. The schedule and staffing requirements are

described in the following sections, exclusive of the transmission line work. Transmission line construction is described in Section 2.6.7.

2.5.7.1 Power Plant Construction

Schedule and Workforce

Construction mobilization is scheduled to occur in April 2010. Construction is based on a single-shift, eight hour per day, five days per week schedule, and facility startup is based on a two-shift, 24 hours per day, seven days per week schedule. Overtime and shift work for construction may be used to maintain or enhance the construction schedule. An estimated peak workforce of 572 craft and professional construction workers (excluding transmission line workers) is anticipated in Month 23 following construction mobilization. (See Section 5.11, Socioeconomics for further discussion on the construction workforce).

Construction Facilities

Mobile trailers or similar suitable facilities (e.g., modular offices) will be used as construction offices for owner, contractor and subcontractor personnel. These construction facilities will be located at the construction laydown area. Some visitor parking will be available in an area adjacent to the construction offices.

Construction Parking

Construction parking for the main site is located southeast on the plant facility (part of the laydown/storage area), as shown in Figure 2-6. This parking area is approximately 1.5 acres in size and will be fenced during the construction period.

Laydown and Storage

An area of approximately nine acres on the eastern portion of the plant site is devoted to equipment and materials laydown, storage, construction equipment parking, small fabrication areas, and office trailers. The construction laydown area is shown in Figure 2-6. Layout of access roads and loading areas is important in the development of the laydown yard. Space is required for large turbine parts, structural steel, piping strings, cable spools, electrical components, switchyard apparatus, and building parts. Sufficient space is provided to accommodate in-storage preventive maintenance activities for equipment such as moving, shaft rotation, connecting, lubricating, and heating. Site access will be controlled for personnel and vehicles. A security fence will be installed around the site boundary, including the laydown area. Site security will be provided on a continuous basis throughout construction.

Site Preparation

There are three principal activities associated with site preparation for the Amended Project: 1) perimeter berm construction, 2) stripping topsoil and replacing with structural fill, and 3) site grading. These activities are described in this section.

As described elsewhere in this Project Description, the perimeter berm serves as both flood protection and as the road base for the perimeter roadways. Cut and fill slopes for permanent embankments of the berm will be designed to withstand horizontal ground accelerations for CBC Site Class D or F. Slopes for

2.0 Project Description

embankments will be no steeper than two to one (horizontal to vertical). The perimeter berm will be constructed according to the following general sequence of events:

1. Strip existing vegetation on the existing berm.
2. Install Straw Wattles on the outside of the proposed embankment to prevent any dirt from leaving the site.
3. Strip the topsoil at a local field that can be used as a borrow site (described below).
4. Excavate soil from the borrow site and process it through one or more pugmills set up at the borrow site. Portland cement will be mixed with the excavated soil to provide structural fill (a.k.a., conditioned soil).
5. Load the conditioned soil onto dump trucks and haul it to the Black Rock site. It might be necessary to also add water to bring the mixture to the optimum moisture content.
6. Starting at the toe of the new slope on the project site, dump and spread the conditioned soil. After the conditioned is spread, compact it with vibratory Sheep's Foot Compactors.
7. Prior to quitting for the day, trim the banks to their proper slope.
8. Repeat the above steps until the berm is at its final grade.

Areas with soil management activities will be wetted regularly to minimize fugitive dust emissions. Such areas would include soil storage piles, the soil borrow site, the active berm areas and soil and equipment haul routes.

Based on the preliminary Geotechnical Report prepared by the Applicant's contractor, it will be necessary to use the process described above to treat some or all of the onsite foundation areas as well. In addition to the topsoil removed from the existing perimeter berm and the foundation areas, 18 inches of topsoil and another 24 inches of material must be removed from the area of the storm water detention basin (~6,100 cubic yards of topsoil plus ~7,800 cubic yards of additional material that might be usable for structural purposes if treated).

Most soils in the Amended Project area are designated as Prime and Statewide Important soil types and will be reserved for reuse, as feasible. Figure 2-15 provides an overview of those areas of the Project site that are proposed to be stripped of topsoil. The Project plans to use the area southeast of the Project site adjacent to Boyle Road that is currently under cultivation to stockpile topsoil from the Project site. The 180,200 cubic yards of stripped topsoil will create a stockpile approximately 600 feet by 1,300 feet by 5.5 feet high. At this time, the slope of the sides of the pile is expected to be three to one (horizontal to vertical).

Once the topsoil is removed, cement-conditioned soil will be imported as follows: 1) 18 inches of conditioned soil will be imported for the laydown area and the well pads (~72,700 cubic yards), 2) the remainder of the area (~1,361,200 square feet) will have an average of three feet of conditioned soil added (~151,240 cubic yards), 3) the berms will require approximately 63,000 cubic yards of cement-conditioned soil, and 4) approximately 74,900 cubic yards of material will be imported for construction of the brine ponds and mud sumps.

For the equipment foundation areas, excavation work will consist of the removal, storage, and/or disposal of earth, sand, gravel, vegetation, organic matter, loose rock, boulders, and debris to the elevations and grades necessary for construction. Materials suitable for backfill will be stored in stockpiles at designated locations using appropriate erosion protection methods. Excess materials will be removed from the site and disposed of at an acceptable location. The bottom of each excavation will be examined for loose or soft areas. Such areas will be excavated fully and backfilled with compacted fill. Backfilling will be done in layers of uniform, specified thickness. Soil in each layer will be properly moistened to facilitate compaction to achieve the specified density. To verify compaction, representative field density and moisture-content tests will be performed during compaction. All testing will be in accordance with American Society for Testing and Materials standards.

Graded areas will be smooth, compacted, free from irregular surface changes, and sloped to drain. The existing site topography will be graded to provide a level area for the facility at about elevation minus 228 feet.

Soil "Borrow" Sites

To provide imported soil for construction at the plant site, the Applicant will use a new borrow site (referred to as the Vulcan 1 borrow site), located immediately southeast of the plant site. The Applicant also will utilize an existing borrow site on property owned by an affiliate that is located adjacent to the existing Leathers geothermal plant less than two miles northeast of the plant site. This site is used routinely on an ongoing basis when imported soil is needed at the existing geothermal facilities. Emissions from transport of borrow material from the borrow site adjacent to Leathers west on Sinclair Road and south on Gentry Road to the Amended Project plant site are included in Project air emissions; emissions associated with transport of borrow material from the Vulcan 1 borrow site also are included (Section 5.2., Air Quality).

In terms of the Project's soil requirements, the perimeter berm will require ~63,000 cubic yards, the buildings/power block area and onsite roads will require ~151,240 cubic yards, the well pads and laydown area will require ~72,700 cubic yards, and the brine ponds and mud sumps will require ~74,900 cubic yards for a total requirement of ~361,840 cubic yards. The borrow site location is shown on Figure 2-1. The stockpiled topsoil removed from the plant site will be used to replace the soil excavated from the borrow site to the extent practicable.

Construction Utilities

Temporary utilities will be provided for the Project site, including construction offices and the laydown areas. Temporary construction power will be supplied by a temporary generator and, when available, at the site by utility-furnished power. Area lighting will be provided and strategically located for safety and security. IID canal water will be used for construction water. Bottled drinking water will be delivered and distributed daily. Portable toilets will be provided throughout the site.

Construction Equipment and Materials Delivery

Materials such as concrete, pipe, wire and cable, fuels, reinforcing steel, and small tools and consumables will be delivered to the site by truck. Truck deliveries will occur weekdays typically between 7:00 A.M. and 5:00 P.M. The estimated daily average truck volumes during Project construction are provided in Section 5.13, Traffic and Transportation.

2.5.7.2 Production/Injection Wells and Pipeline Construction

Well drilling operations will be conducted 24 hours a day, seven days a week until the proper depth is reached. An estimated eight weeks will be required to drill each well, and approximately 12 people will be working at each site at any one time.

Well Construction

Site preparation, including drill rig assembly, should require approximately one to two weeks per well. Preparation of a typical drilling site will involve grading (clearing and leveling) approximately one to 1.5 acres per well, which will contain an equipment staging and activity area, a drill pad and a mud sump (see description below). Site clearing and preparation (removing vegetation and minor leveling) will require the use of heavy diesel-powered earthmoving equipment, including bulldozers, scrapers, dump trucks, and front-end loaders. The Applicants anticipates that two drill rigs may be operated simultaneously during the construction period. The drill rigs are diesel-electric, i.e., three 1.5-MW diesel-fired generators provide electric power to the electric drill motor. The wells will be cased to a depth of approximately 2,500 feet with titanium casing.

Mud Sumps

Spent drilling fluids and cuttings will initially be managed in RWQCB-permitted, clay-lined mud sumps located on site in close proximity to the drilled wells to contain and dry the drilling waste. Drilling waste will consist of soils, brine effluent, and other materials removed from the ground during the construction of production and injection wells. (Drilling wastes and management of drilling wastes are discussed in more detail in Section 2.5.7.5.) A total of six total temporary mud sumps will be constructed, one for each of three production well pads and one for each of three injection well pads. In addition to the six mud sumps, the Project construction schedule is arranged so that the three brine ponds on the plant site initially will be available and used for managing drilling wastes.

The mud sumps are temporary containment ponds that will be decommissioned and removed subsequent to completion of the well construction activities. The mud sumps will be approximately 726 feet long by 11 feet wide by five feet deep, with two feet of freeboard. These sumps are lined impoundments employing geosynthetic/compacted clay lining systems to hydraulically isolate them from the underlying groundwater table. The Applicant routinely constructs, uses, and decommissions these structures as a part of its ongoing operations and is thoroughly familiar with the required construction, operating, monitoring, and management practices associated with mud sumps.

Pipeline Construction

Pipeline construction will consist of various activities, including, but not limited to, clearing and grubbing, excavation for pipeline supports, pipe handling and welding. Site clearing and preparation (removing vegetation and minor leveling) will require the use of heavy diesel-powered earthmoving equipment, including bulldozers, scrapers, dump trucks, and front-end loaders. Site clearing and preparation will occur at all locations where equipment will be constructed or installed. The ROW associated with the injection pipeline will be prepared by removing debris and land leveling as each component is being constructed. Erosion control measures will include minimizing time between clearing and construction and installing silt fencing. The routes for the offsite pipelines are shown on Figure 2-1.

The pipe will be field welded during assembly. Only certified welders will perform the work. Welding procedures are developed in accordance with the latest edition of American Society of Mechanical Engineers power piping code B31.1. After assembly, each pipeline will be subjected to a hydrostatic test at 150 percent of the system normal operating pressure. Test pressure is held for sufficient time to walk the entire length of the pipeline and inspect for leaks.

2.5.7.3 Water Demand during Construction

As noted above, Amended Project construction activities will occur over a roughly four-year period. Construction-phase water demand will be greatest during site grading, most of which will occur over the entire 160-acre site for all three units as part of a single effort rather than grading the individual power plant sites separately. The peak water during construction is expected to occur early in the construction of the Amended Project during a period in which both perimeter berm construction and site grading are occurring; the peak demand during that period will be approximately 180,000 gpd. This usage is expected to occur over a period of only one month. Outside of the grading period, average daily water demand during project construction is expected to be between approximately 80,000 and 95,000 gpd depending on the activity levels for the site compaction and grading. Water use during the remainder of the construction period will be for such activities as mixing concrete and hydrostatic testing. Hydrostatic testing of the pipelines will require approximately 17.9 acre-feet of water, all of which is expected to be consumed in the first year of construction. Used hydrostatic test water will be discharged to the on-site storm water detention pond in accordance with RWQCB permit requirements for hydrostatic test water. The total water required for construction activities, is expected to be approximately 300 acre-feet. Water for construction will be provided by IID. Construction activities for the Amended Project are not expected to significantly impact water availability.

2.5.7.4 Hazardous Materials Used during Construction

A variety of hazardous chemicals will be stored and used during construction of the Project, including unleaded gasoline, diesel fuel, oils and lubricants (e.g., motor oil, transmission fluid, and hydraulic fluid), solvents, adhesives, and paint and paint thinner. There are no feasible alternatives to these materials for construction or operation of construction vehicles and equipment, or for painting buildings and equipment. The construction contractor will be responsible for assuring that the use, storage, and handling of these hazardous materials comply with applicable Federal, State, and local laws, ordinances, regulations, and standards (LORS), including permitting, personnel training, accumulation limits and storage/containment requirements, reporting requirements, and recordkeeping. Well drilling will require a large quantity of drilling fluids ("mud") to support the well drilling activities.

2.5.7.5 Waste Generation during Construction

Construction and operation of the Amended Project will not result in significant changes in the quantity or characteristics of hazardous wastes requiring Class I landfill disposal, non-hazardous waste requiring disposal in a Class II or Class III landfill, municipal solid waste requiring disposal in a Class III landfill, or universal waste that would be recycled, when compared to construction of the original SSU6 project, and would have no significant adverse impacts in any case.

Drilling Wastes

The construction of the production, injection, and plant wells associated with the Amended Project will result in several waste streams. These are expected to include:

- Spent drilling fluids and drilling cuttings,
- Well construction wastes (solid waste), and
- Fluids from performing “flowbacks” on the completed wells.

Spent drilling fluids and cuttings will initially be managed in mud sumps (see Section 2.5.7.2 for additional details regarding the mud sumps) or the brine ponds. Drilling wastes will be pumped to the mud sumps and brine ponds where the liquid constituents will be allowed to separate by gravity and/or evaporate. Gravity-separated fluids may be pumped or conveyed by truck between sumps/ponds as management demands dictate. Decanted fluids will be injected into the geothermal formation to help preserve the geothermal resource. Geothermal drilling wastes are exempt from regulation as hazardous waste under California Health and Safety Code Section 25143.1. Project drilling wastes will be disposed of in the Applicant’s affiliate-operated local monofill.

After a well is completed, it must be “backflowed”. That is, the well is flushed to remove drilling mud remnants, cuttings, and other materials that ultimately might inhibit the well’s performance. Depending on the well, a certain amount of geothermal brine may also be entrained in the flowback stream. The amount of material generated from this activity varies; however, in practice the well is flowed until such time as the fluids are “clear”. The Applicant proposes to manage these materials in the same manner as the drilling wastes discussed above.

Solid waste from well construction will be managed in roll-off containers. These containers will be removed from the job site by a permitted hauler and conveyed to a permitted facility for ultimate disposal.

Hazardous Waste

Hazardous waste generated by the Amended Project during construction will be accumulated onsite for less than 90 days at specified accumulation points. Hazardous and universal wastes will be transported by a licensed transporter using a Uniform Hazardous Waste Manifest and disposed or recycled at an appropriate Treatment, Storage or Disposal Facility (TSDF). Copies of manifests, reports, waste analysis, exception reports, land disposal restrictions, and other related documents will be maintained onsite as required.

Miscellaneous Construction Wastes

During construction of the Amended Project, the primary type of waste generated will be solid non-hazardous wastes. Small quantities of non-hazardous liquid wastes, hazardous solid and liquid wastes, and universal wastes may also be generated during construction. Non-hazardous wastes generated during construction is expected to include scrap wood, concrete, empty containers (plastic, metal, glass, cardboard, and Styrofoam), packaging materials, scrap metals, insulation (silicate and mineral wool), and drilling wastes. Approximately 20 to 40 cubic yards per week of construction wastes are expected to be generated during construction of the Amended Project. Management of these wastes will be the responsibility of the construction contractor(s). Where practical, such as in the case of scrap steel and

paper, the wastes will be recycled. Non-hazardous wastes will be properly stored to prevent wind dispersion, and will be transported by a licensed transporter and disposed or recycled at an appropriately-permitted facility.

Mud Sumps

The mud sumps will be decommissioned following completion of the wells they serve. Because the clay liner of the mud sump is in direct contact with both drilling fluids and brine, the clay (and the geomembrane liner materials) may become contaminated and therefore will be treated as waste. The clay will be tested to determine the appropriate disposal requirements. If determined to be non-hazardous, the clay would be disposed at the Desert Valley Company's Monofill Facility, a Class II landfill. If hazardous, the clay would be disposed at an appropriate Class I TSDF.

Sanitary Waste

During construction, sanitary waste will be collected in portable, self-contained toilets. The sanitary wastes from the portable chemical toilets will be pumped out regularly by a licensed contractor and transported to a sanitary wastewater treatment plant.

2.5.7.6 Emergency Facilities

Emergency services will be coordinated with the Niland and Calipatria fire departments and area hospitals. The County has Emergency Medical Services available. First-aid kits will be provided around the site and regularly maintained. At least one person trained in first aid will be part of the construction staff; additionally, all foremen and supervisors will be given first-aid training. Fire extinguishers will be located throughout the site at strategic locations during construction.

2.5.8 Project Operation

Both the original SSU6 project and the Amended Project are generating facilities designed for the restructured California energy market. The plant design and operating philosophy will be based on operation as a merchant plant in the competitive California electricity market, with a high emphasis on efficiency and flexibility.

2.5.8.1 Normal Operations

Generally, the plant will be operated as a base load facility to provide its maximum electrical output throughout the year; the plant is expected to operate in excess of 8,000 hours per year. The Amended Project is expected to be operated by a staff of approximately 69 full-time, onsite employees. The facility will be capable of operation seven days per week, 24 hours per day. Plant operations will be controlled from the operator's panel in the Control Room. The Amended Project is expected to have an operating life of 30 years.

2.5.8.2 Startup and Shutdown

Startup and shutdowns for the Amended Project will be the same as for the original project. To start the plant from a zero percent dispatched operating mode, power will be back fed through the L-Line

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Interconnection to bring the facilities online. Auxiliary systems and the RPF will be started up first. After production of turbine-quality steam has been confirmed, steam will be directed to the STG. After achieving full speed, the turbine generator will be synchronized with the transmission grid.

The Amended Project is anticipated to start up five times per year, one “cold start” and four “warm starts”. The time required for startup of the plant is approximately 45 hours when the plant has been completely shut down (cold startup) and all brine flow to the plant has been secured for an extended period. A warm start will occur when the turbine is taken offline and the RPF continues to operate. A startup in this condition will require approximately four hours. It is anticipated that four stops (and thus four warm starts) per turbine will occur per year due to short-term outages.

2.5.8.3 Plant Maintenance

Planned maintenance will be coordinated to reduce the impact caused by a unit shutdown. Normally, major maintenance work such as unit overhauls will be planned during the spring periods when the need for electricity is reduced. Operation of the water supply pipeline will be in accordance with general industry standards. The pipeline will receive periodic inspection as part of the Project's maintenance program.

2.5.8.4 Hazardous Materials Used During Operations

Hazardous chemicals will be stored in chemical storage facilities appropriately designed for the chemicals' hazard or risk characteristics. Bulk chemicals will be stored outdoors on impervious surfaces in aboveground storage tanks with secondary containment. Secondary containment areas for bulk storage tanks will not have drains. Any chemical spills in these areas will be removed with portable equipment and reused or disposed of properly. Other chemicals will be stored and used in their delivery containers. A portable storage trailer may be employed on site for storage of maintenance lube oils, chemicals, paints, and other hazardous materials, as needed. A list of the hazardous materials planned for use at the Amended Project is provided in Table 2-7.

Safety showers and eyewash stations will be provided in or adjacent to chemical storage and use areas. Personal Protective Equipment will be provided for personnel use as needed. All personnel working with chemicals will be trained in their proper handling and in emergency response to chemical spills or accidental releases. Hose bib connections will be provided near chemical storage and feed areas to flush spills and leaks, and absorbent materials will be stored on site for spill cleanup.

Table 2-7 Hazardous Materials Used for Operations

Common Name	Chemical Name	Chemical Use	Largest Container	Type of Container
Diesel #2	Petroleum Hydrocarbon	Fuel in Emergency Engines	600 Gallons	Tank
Gear Oils	Petroleum Hydrocarbon	Lube oil for rotating equipment	55 Gallons	Drum
Hydrochloric Acid	Hydrochloric Acid (36 to 38 percent)	Cleaning injection well piping	11,000 Gallons	Tank

Table 2-7 Hazardous Materials Used for Operations

Common Name	Chemical Name	Chemical Use	Largest Container	Type of Container
	Hydrochloric Acid (2.5 percent)	Cleaning injection well piping	38,000 Gallons	Tank
Urea	Urea	Air emission control for the emergency engines	400 Gallons	Tote
Mixed Gas	Mixture	Testing of emission control monitoring equipment	1,600 Cubic Feet	Tank
Monopotassium Phosphate	Monopotassium Phosphate	Cooling tower water treatment	50 Pounds	Bag
Nalco 1317 Liquid	Ethylene Thiourea	Cooling tower water treatment	400 Gallons	Tote
Nalco 1387 Inhibitor	Ethylene Glycol	Cooling tower water treatment	400 Gallons	Tote
Nalco 97ND048	Linear alkyl benzene sulfonate	Cooling tower water treatment	400 Gallons	Tote
Nalco 73202	Mixture of Sodium Bisulfate and Sodium Formaldehyde Bisulfite	Cooling tower water treatment	400 Gallons	Tote
Bleach (Biocide)	Sodium Hypochlorite	Biocide in cooling tower	5,000 Gallons	Tank
Sulfuric Acid	Sulfuric Acid (93 percent)	Electrolyte in batteries	55 Gallons	Battery
Towerbrom 991	Mixture of Trichloro-S-Triazinetrione and Sodium Bromide	Oxidizer for H ₂ S treatment in condensate	50 Pounds	Plastic pail
Transformer Oil	Petroleum Hydrocarbon	Insulating oil in transformers	6,295 Gallons	Transformers
Sodium Hydroxide (solution)	Sodium Hydroxide	H ₂ S Scrubber for air emission control and hydrochloric acid scrubber for steam conditioning	5,000 Gallons	Tank
Propane	Propane	Fuel for RTO	2,000 Gallons	Tank
Turbine Oil 32	Petroleum Hydrocarbon	Lube oil for STG	10,000 Gallons	Tank
Vector 800 Cleaner	Mixture of Sodium Hydroxide and Sodium Metasilicate	Equipment cleaning	55 Gallons	Plastic Drum

2.5.8.5 Waste/Byproduct Generation During Operation

Wastes generated by the Amended Project during operation include wastewater, non-hazardous solid waste and hazardous solid waste.

Spent Brine

The Amended Project will produce “spent brine”. Under normal operating conditions, this spent brine will go immediately to injection in dedicated injection wells located off the main plant site. However, during start-up and shutdown events, this brine may be flowed to one of three lined brine ponds. This material, referred to as “aerated brine” (i.e. – because it’s been exposed to the air) will be diluted with water, if necessary, and injected into one of two dedicated aerated brine wells located on the main plant site. Residual solids, if any, will be managed as indicated below.

Brine Solids

During plant-upset conditions, during well flow testing, or during startup, production brines would be discharged to the ponds. The Amended Project will include three ~2.1 million-gallon brine ponds. The brine ponds will be used for the collection of miscellaneous byproduct streams prior to their injection into the formation. The brine is then pumped into one of two aerated brine injection wells located on the plant site. Although the Amended Project is expected to generate substantially fewer solids than the original SSU6 project, a small amount of solids are expected to precipitate out of the brine in the brine pond. The rate of accumulation is expected to be no more than a few tons per year. The Applicant estimates that no more than 10 tons per year would accumulate, compared to 200 tons per year for the original project. As needed, brine pond liquids will be pumped out and injected, and the solids will be removed, dewatered in a trailer-mounted pressure filter press, and transported by a licensed transporter to an appropriately permitted offsite facility.

Wastewater

The base load and peak load water balance diagrams (Figures 2-12a and 2-12b) show the power plant’s wastewater streams and the disposition of wastewater. Sources of wastewater and their dispositions include:

- Blowdown from the cooling towers will be injected into one of the two dedicated plant injection wells.
- Blowdown from the quench and SO₂ scrubber stages of the air emissions control system will be bled into the cooling tower basin, and will be injected into one of the two dedicated plant injection wells along with the cooling tower blowdown.
- Blowdown from the chloride scrubber following the HP separator in the RPF will go to the brine pond and then will be injected into one of the two aerated brine injection wells.
- Reject water from the RO water purification system will be pumped to the cooling tower basin.
- Uncontaminated storm water collected in the chemical storage and feed containment areas that contain fixed or portable tanks and other containers will be directed to the brine ponds and discharged together with other plant wastewater to a dedicated plant site injection well.

Sanitary Waste

Sanitary waste generation will be the same as that estimated in the original SSU6 project. Sanitary waste for the Amended Project will be directed to a septic tank, which will be constructed according to the Imperial County building code. This tank will be pumped out as necessary; there will be leach field. There are no

drinking water wells in the area near the Amended Project. No significant impacts to water quality are expected from the septic system. During construction, sanitary waste will be collected in portable, self-contained toilets. The sanitary wastes from the portable chemical toilets will be pumped out regularly by a licensed contractor and transported to a sanitary wastewater treatment plant.

Well Rehabilitation

Periodically (once every five to 10 years), production or injection wells have to be re-drilled to maintain their productive capacity. Wet drilling wastes consist of soils, brine effluent, and other materials removed from the ground during the re-drilling of production and injection wells. This waste will be allowed to dry out in RWQCB-permitted, clay-lined mud sumps. By regulation, geothermal drilling wastes are non-hazardous; therefore, after evaporation, the remaining solid waste in the mud sumps will be disposed at the Desert Valley Company's Monofill Facility, a Class II landfill.

Facility Operation and Maintenance Wastes

Office waste and general refuse will be recycled to the extent practicable and the remainder will be disposed by the local sanitation service to a Class III landfill.

Pipe maintenance and de-scaling activities that include hydroblasting or sandblasting will be performed in a designated containment area to prevent wastes generated from these activities from impacting the environment. Water from the hydroblasting process will be conveyed to the brine ponds for injection into the geothermal resource.

Hazardous Wastes

Hazardous and universal wastes expected to be generated by the Amended Project during normal operations include the limited amounts of brine pond solids (if testing reveals them to be hazardous), scale from the walls of piping and brine handling equipment, used oil, oil adsorbents, cleaning solutions and solvents, empty containers, fluorescent lamps, and used batteries. Brine pond solids and pipeline scale will be tested to determine whether or not they are hazardous wastes. If determined to be non-hazardous, these wastes would be removed regularly by a certified waste handling contractor to the Applicant's affiliate operated Class II monofill. Hazardous wastes would be disposed at an appropriate Class I hazardous waste management facility. There are a large number of disposal contractors available to assist the Applicant with management of recyclable materials such as used oil, spent lead-acid batteries, empty 55-gallon drums, fluorescent lamps, scrap paper, or oily rags. Hazardous wastes that cannot be recycled will be disposed of in an appropriate TSDF.

2.6 Transmission Line Description

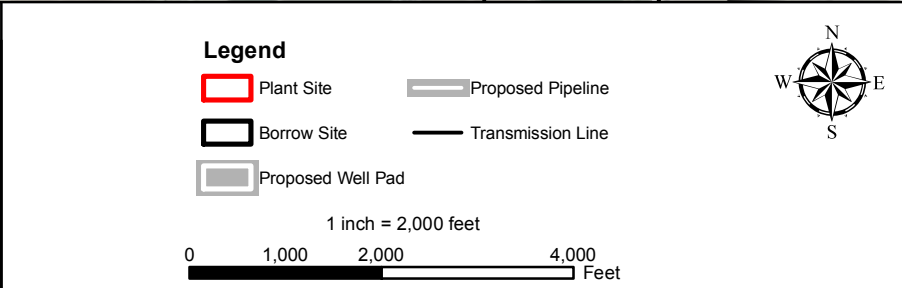
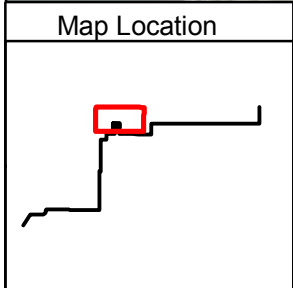
As noted earlier, the transmission lines associated with the Amended Project are exactly the same as those proposed and evaluated in the original SSU6 licensing process. Because the transmission lines are unchanged from the original project, so are the impacts associated with them. The information provided below is summarized from the original SSU6 AFC and is provided here for convenience. Minimal additional discussion of the transmission lines is provided in this AP.

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The IID will engineer, construct (or supervise and review the engineering and construction), own, operate, and maintain the transmission lines required for the facility starting at the facility's high-side switch of the generator step-up transformer. IID will operate the L-Line Interconnection between the Project switchyard and the existing L-Line and will also operate the IID Midway-Interconnection between the Project switchyard to the existing Midway Substation (see Figure 2-1). The proposed 16-mile double-circuit L-Line Interconnection and the proposed 15-mile single-circuit IID Midway Interconnection will be a direct inter-tie between the Project and IID's existing L-Line and Midway substations.

As part of the original SSU6 project, the Applicant applied to IID to interconnect the proposed generating plant the IID grid. IID performed a SIS to examine the impact of a new 185-MW geothermal plant in the Salton Sea region. The SIS found that the original SSU6 project would not create any system impact or stability problems. The Applicant has initiated the development of a new SIS with IID. The new SIS will be completed and provided to CEC staff before the CEC issues its final decision on the AP.


Single-pole steel structures ranging from 100 to 125 feet high will be used for both the L-Line and IID Midway interconnections. Approximately 132 structures spaced 800 to 1,200 feet apart will be necessary for both lines, depending on final design. The construction, operation, and maintenance of the proposed transmission lines will require that heavy vehicles access structure sites along the ROW. Existing paved and unpaved highways and roads will be used to the greatest extent possible to minimize potential impacts associated with new construction.




Amended SSU6 Project

**Figure 2-1
Project Site**

Mapsheet 01 of 10

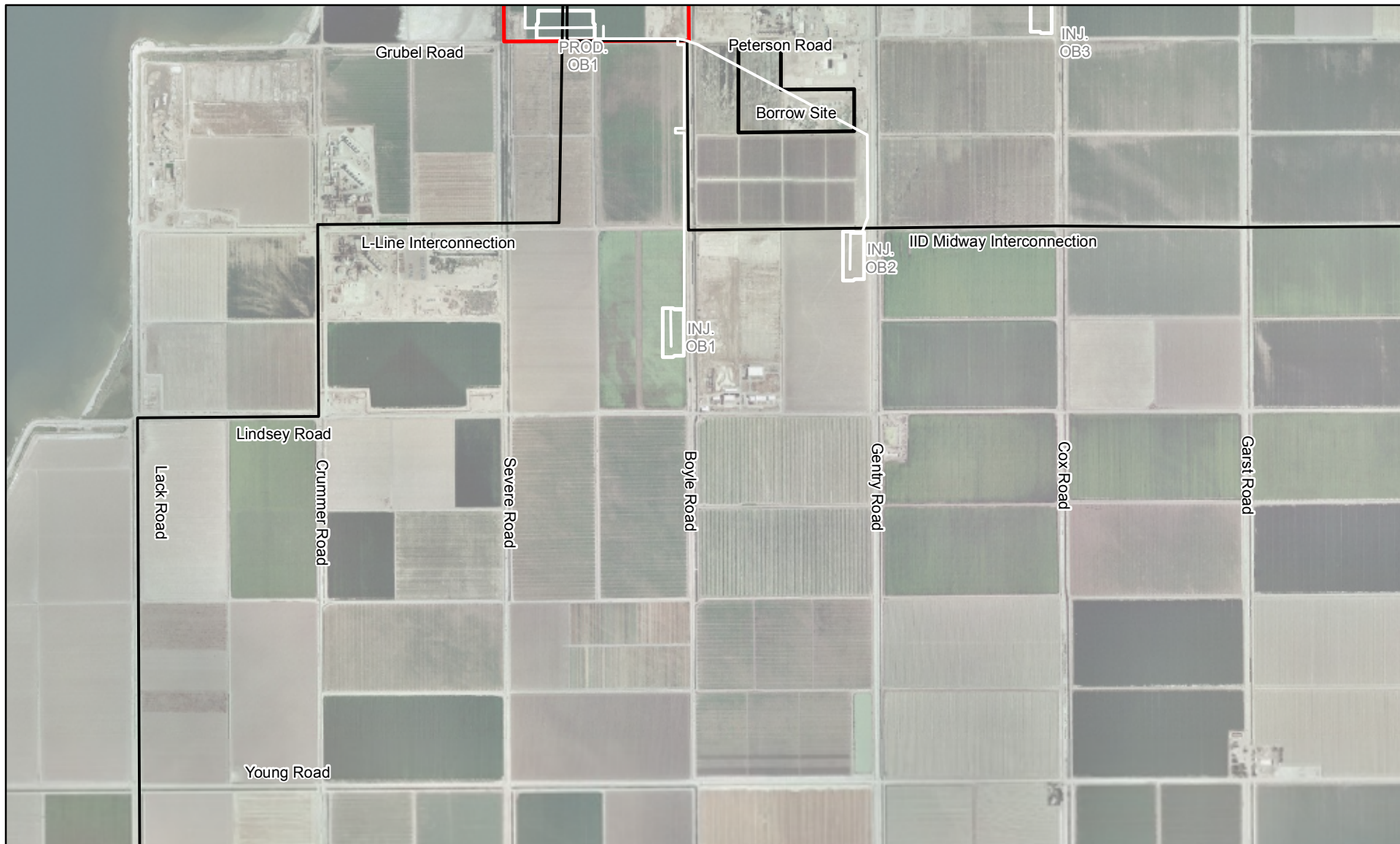


CEGENERATION_{LLC}
A MIDAMERICAN ENERGY HOLDINGS COMPANY AFFILIATE

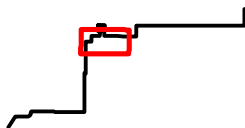


Project: 12676-001
Date: February 2009

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Map Location



Legend

- Plant Site
- Borrow Site
- Proposed Well Pad
- Proposed Pipeline
- Transmission Line

1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet



Amended SSU6 Project

Figure 2-1 Project Site

Mapsheet 02 of 10

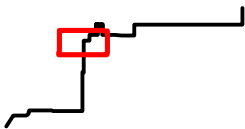


AECOM

Project: 12676-001
Date: February 2009



Map Location



Legend

- Plant Site
- Borrow Site
- Proposed Well Pad
- Proposed Pipeline
- Transmission Line

1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet



Amended SSU6 Project

Figure 2-1 Project Site

Mapsheet 03 of 10

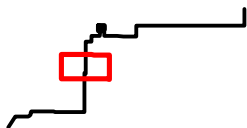


AECOM

Project: 12676-001
Date: February 2009



Map Location



Legend

- Plant Site
- Borrow Site
- Proposed Well Pad
- Proposed Pipeline
- Transmission Line

1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet



Amended SSU6 Project

Figure 2-1 Project Site

Mapsheet 04 of 10

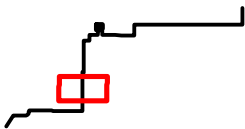


AECOM

Project: 12676-001
Date: February 2009



Map Location



Legend

- Plant Site
- Borrow Site
- Proposed Well Pad
- Proposed Pipeline
- Transmission Line

1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet



Amended SSU6 Project

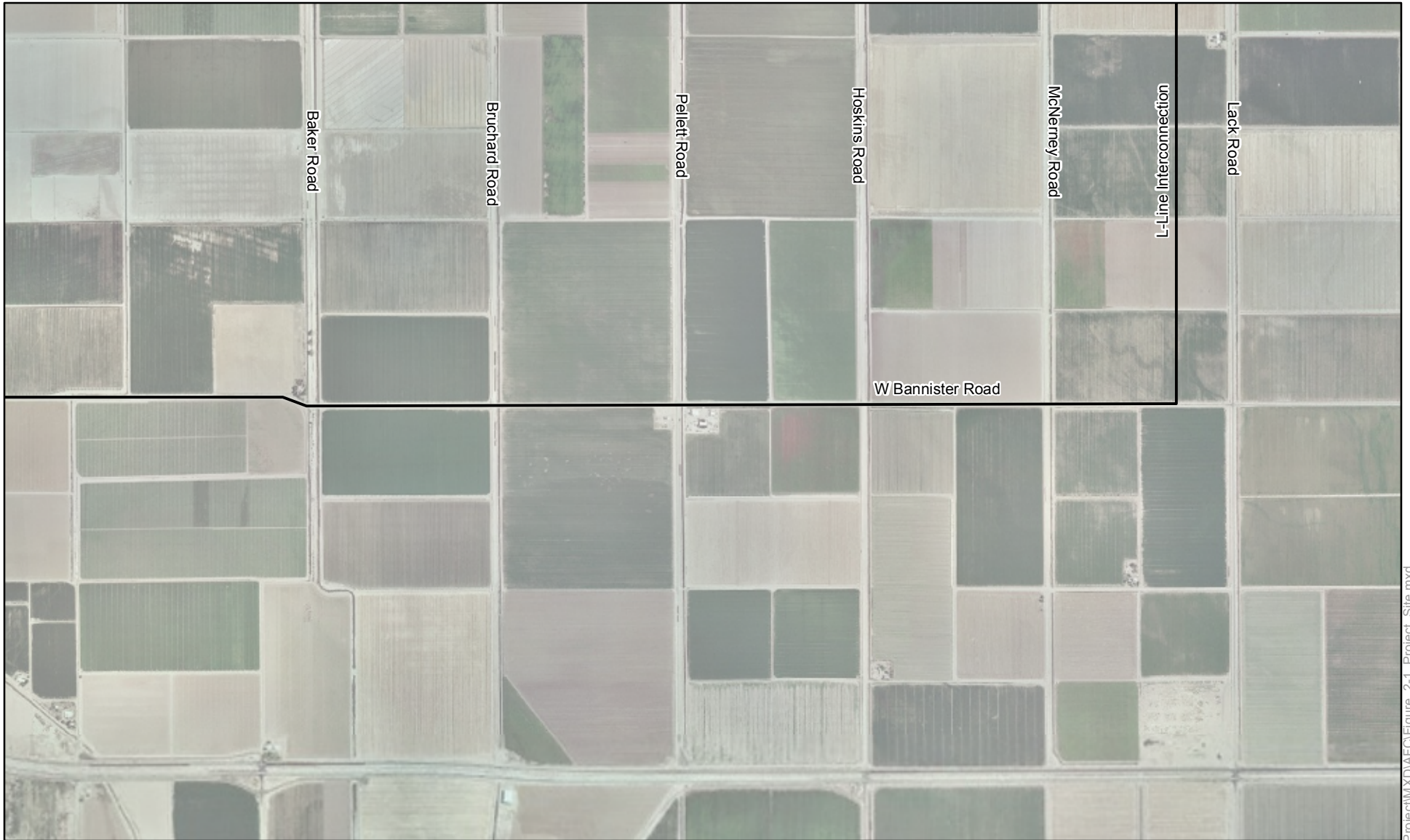
Figure 2-1 Project Site

Mapsheet 05 of 10

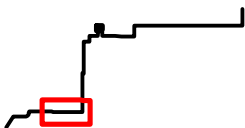


AECOM

Project: 12676-001
Date: February 2009



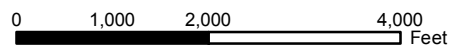
Map Location



Legend

- Plant Site
- Borrow Site
- Proposed Well Pad
- Proposed Pipeline
- Transmission Line

1 inch = 2,000 feet



Amended SSU6 Project

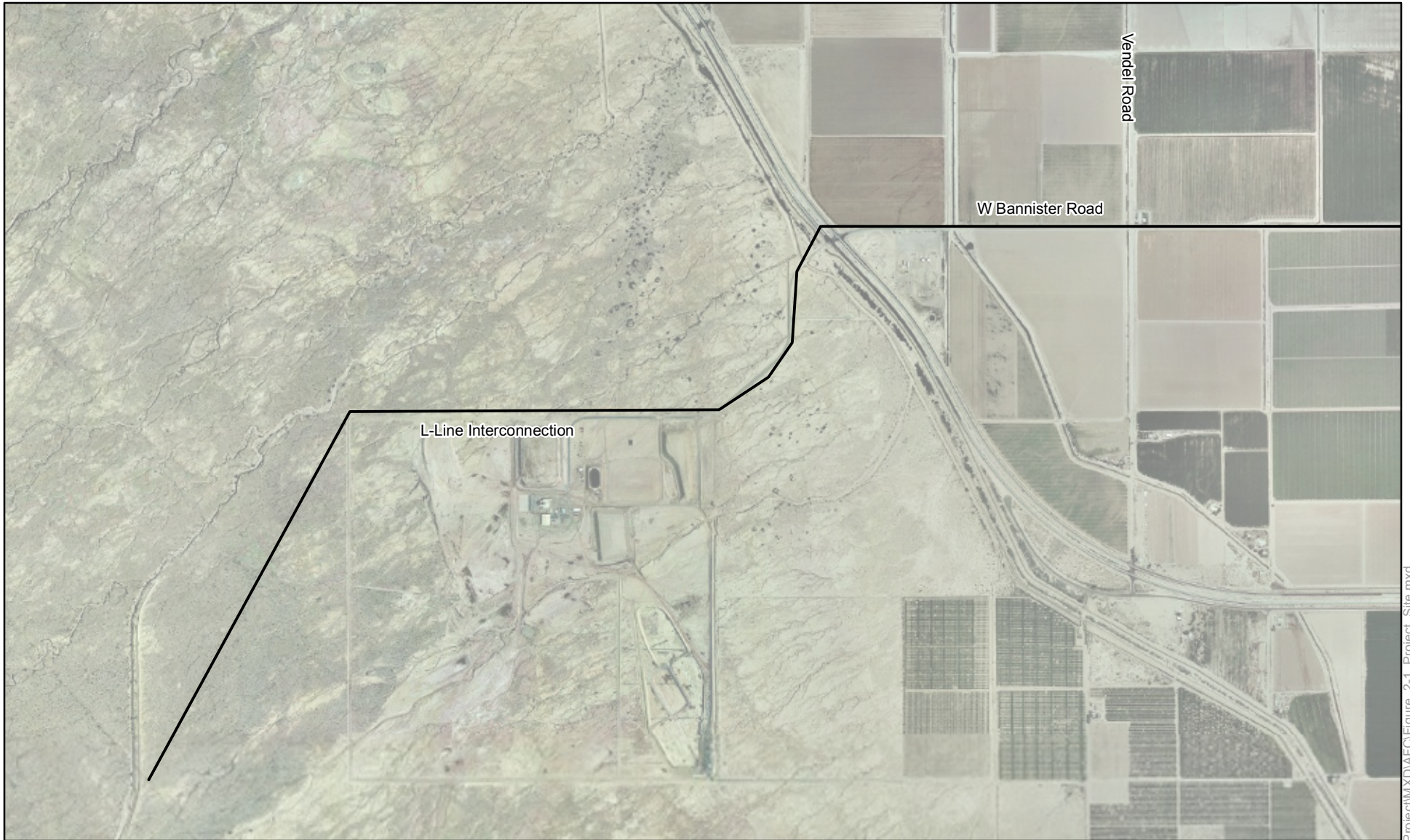
Figure 2-1 Project Site

Mapsheet 06 of 10

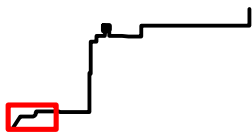


AECOM

Project: 12676-001
Date: February 2009



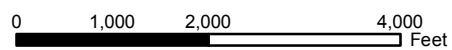
Map Location



Legend

- Plant Site
- Borrow Site
- Proposed Well Pad
- Proposed Pipeline
- Transmission Line

1 inch = 2,000 feet



Amended SSU6 Project

**Figure 2-1
Project Site**

Mapsheet 07 of 10

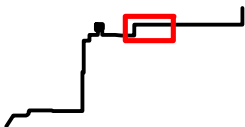


AECOM

Project: 12676-001
Date: February 2009



Map Location



Legend

- Plant Site
- Borrow Site
- Proposed Well Pad
- Proposed Pipeline
- Transmission Line

1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet



Amended SSU6 Project

Figure 2-1 Project Site

Mapsheet 08 of 10

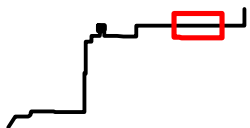


AECOM

Project: 12676-001
Date: February 2009



Map Location



Legend

- Plant Site
- Borrow Site
- Proposed Well Pad
- Proposed Pipeline
- Transmission Line

1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet



Amended SSU6 Project

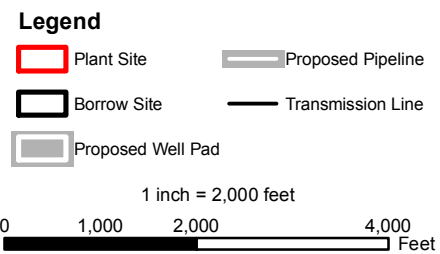
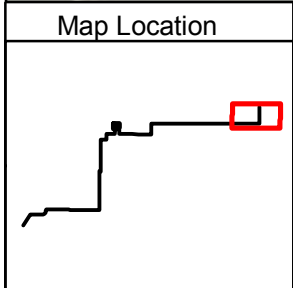
Figure 2-1 Project Site

Mapsheet 09 of 10



AECOM

Project: 12676-001
Date: February 2009



Amended SSU6 Project

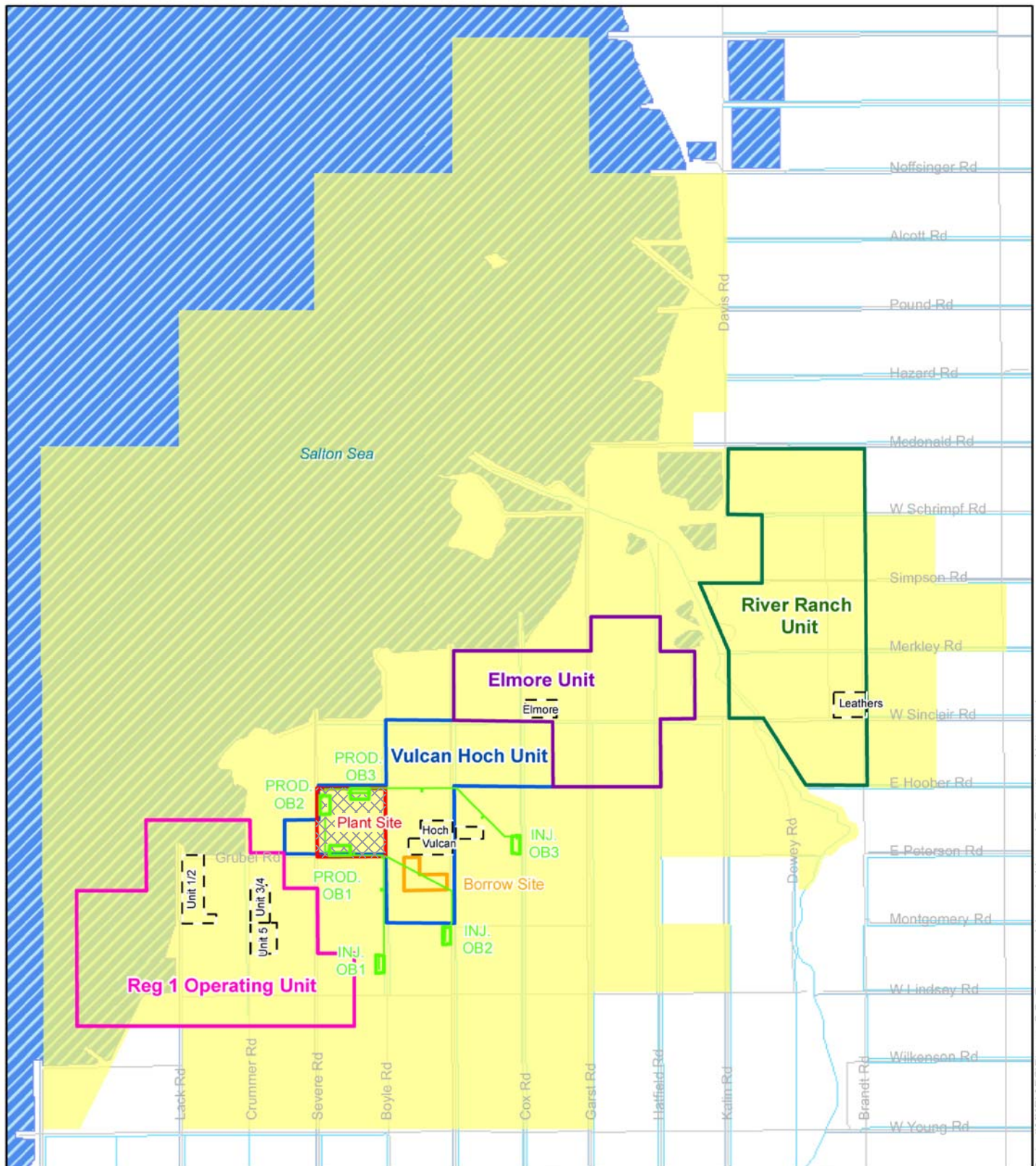
**Figure 2-1
Project Site**

Mapsheet 10 of 10



AECOM

Project: 12676-001
Date: February 2009



Legend

- Plant Site
- Borrow Site
- Proposed Well Pad
- Mineral Lease Area
- Proposed Pipeline



1 inch = 1 miles

0 0.5 1 2 Miles

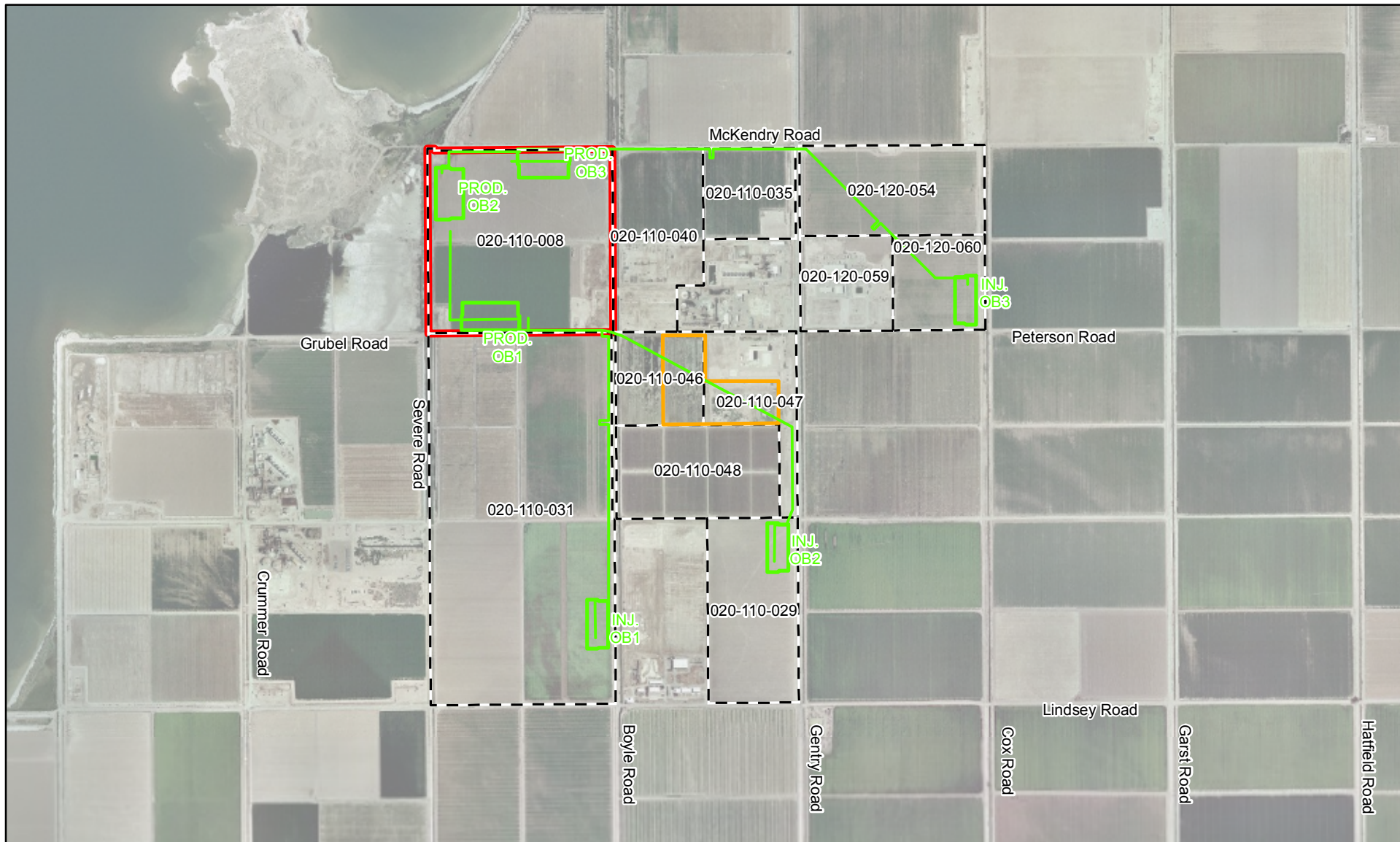
Amended SSU6 Project Figure 2-2 Geothermal Leaseholds and Operating Units



AECOM

Project: 12676-001
Date: February 2009

Y:\Projects\CalEnergy\Black_Rock_Project\MDA\FACI\Figure_2-2_Geothermal_Leaseholds_and_Operating_Units.mxd

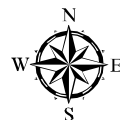


Legend

- Plant Site
- Borrow Site
- Proposed Pipeline
- Assessor Parcels
- Proposed Well Pad

1 inch = 2,000 feet

0 1,000 2,000 4,000 Feet



Amended SSU6 Project

Figure 2-3
Assessor Parcel Numbers for
Geothermal Leaseholds



AECOM

Project: 12676-001
Date: February 2009

Figure 2-4 Project Site – Existing Conditions

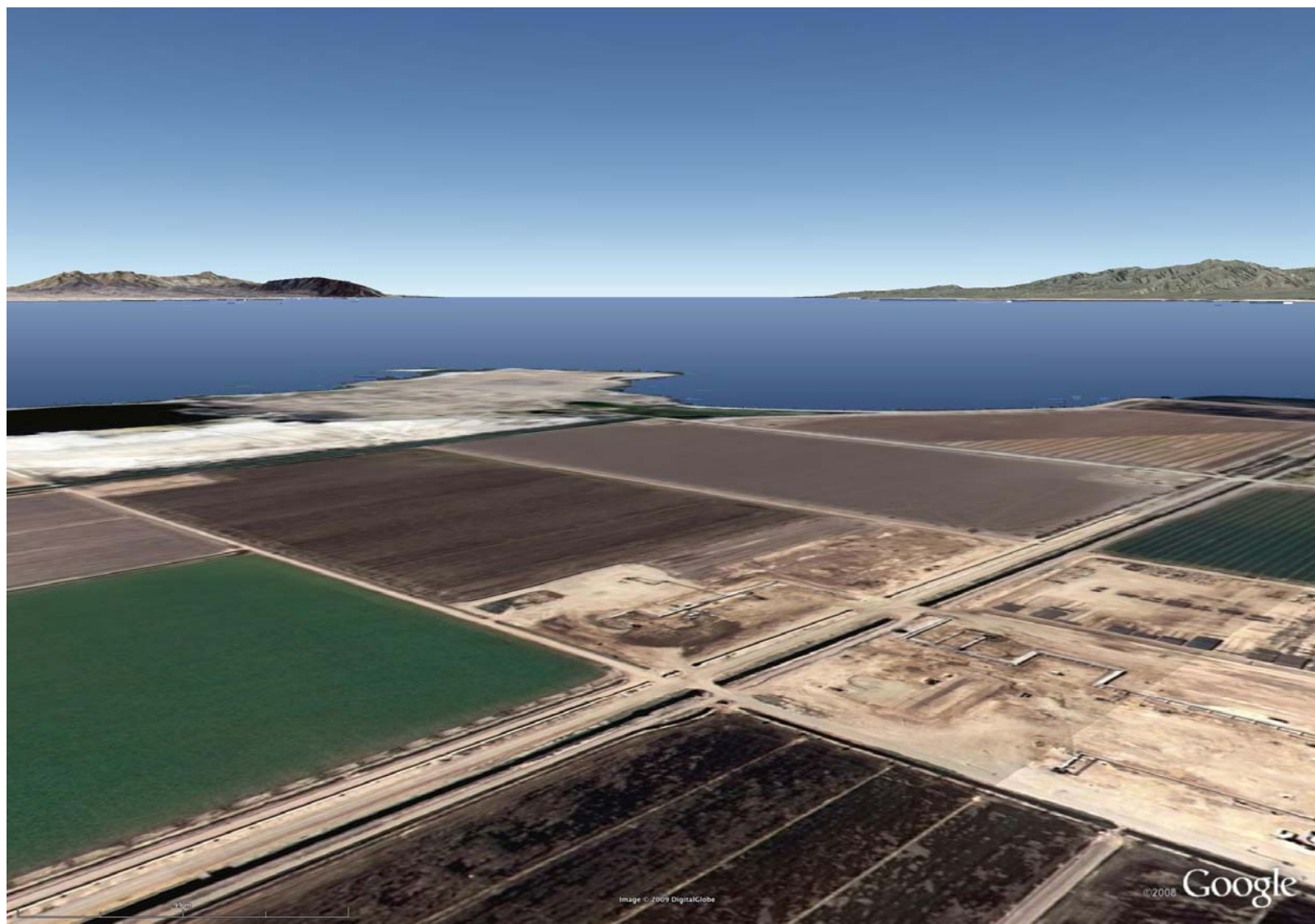
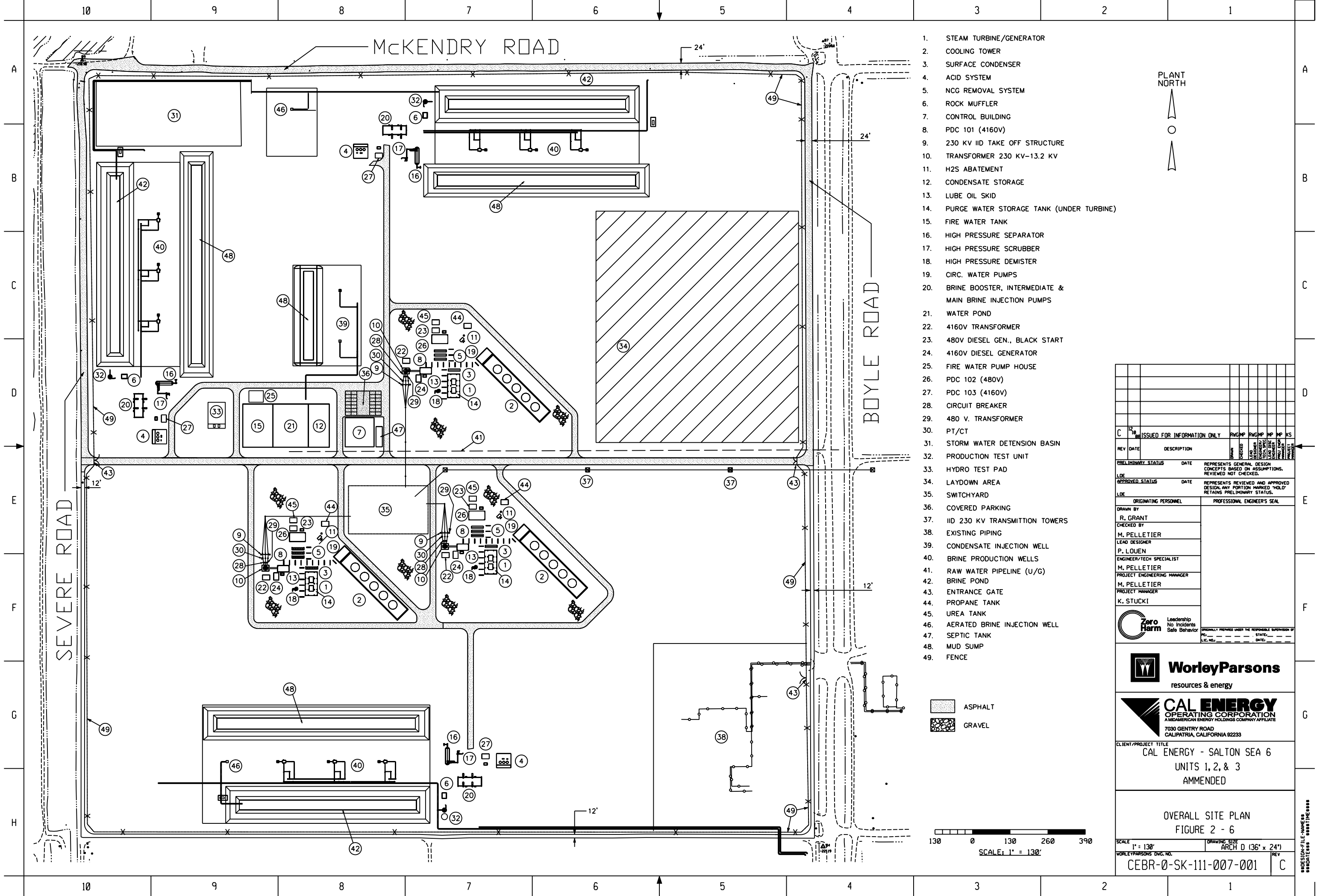


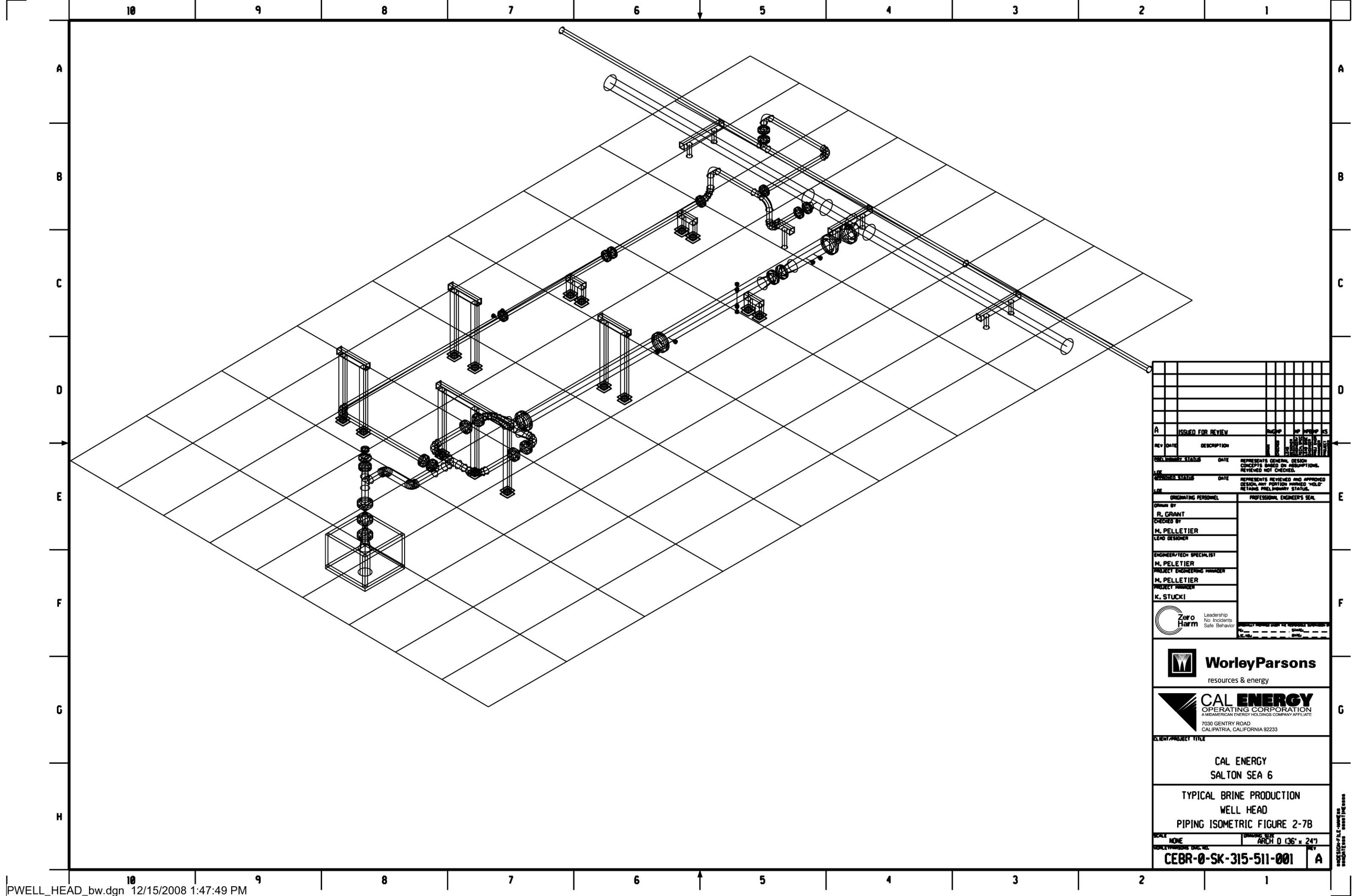
Figure 2-5 Project Site – With Simluated Project Facilities

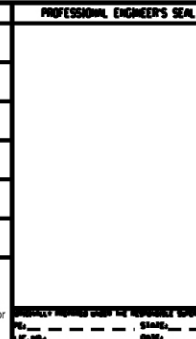





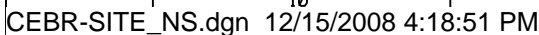


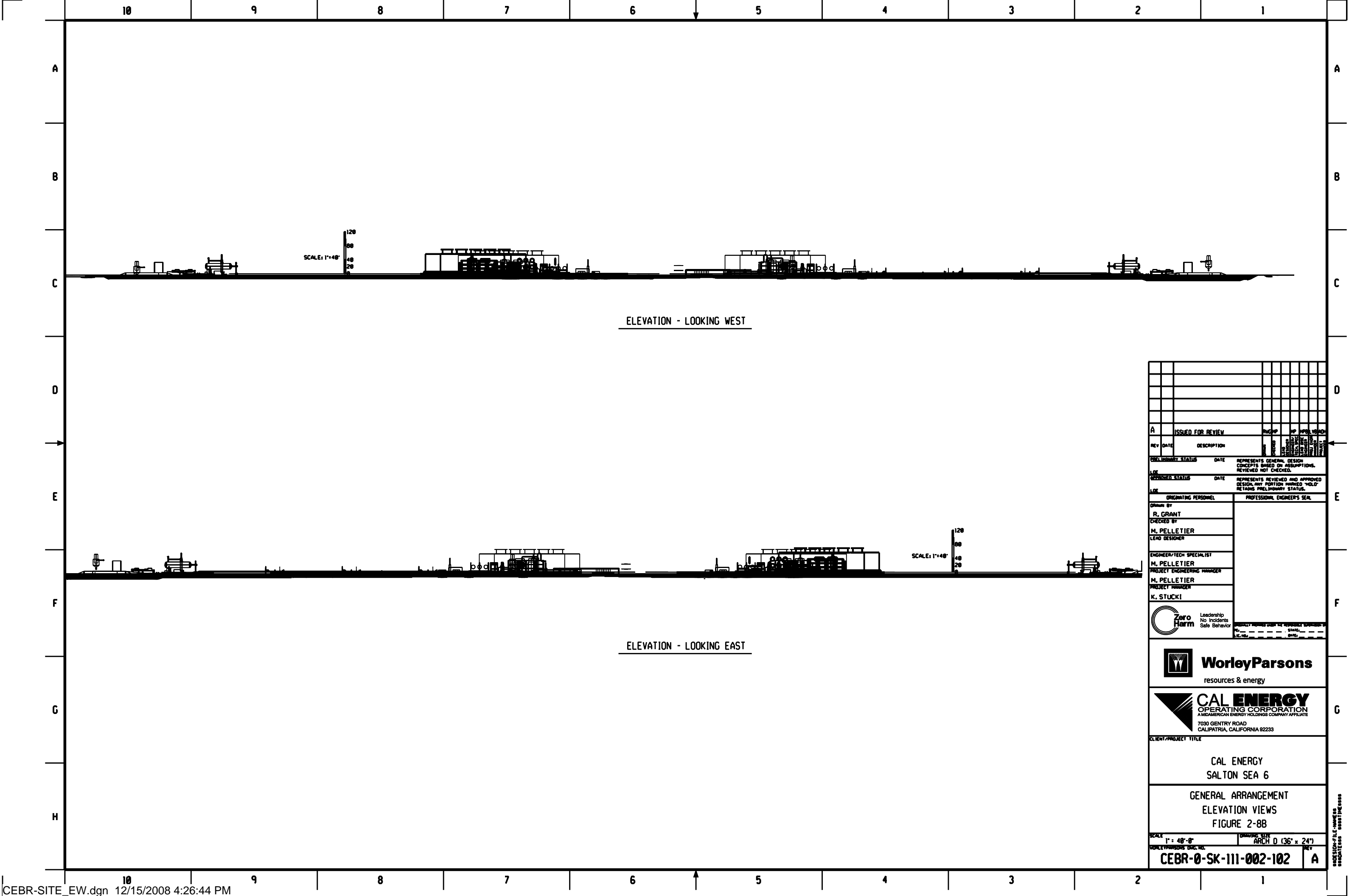
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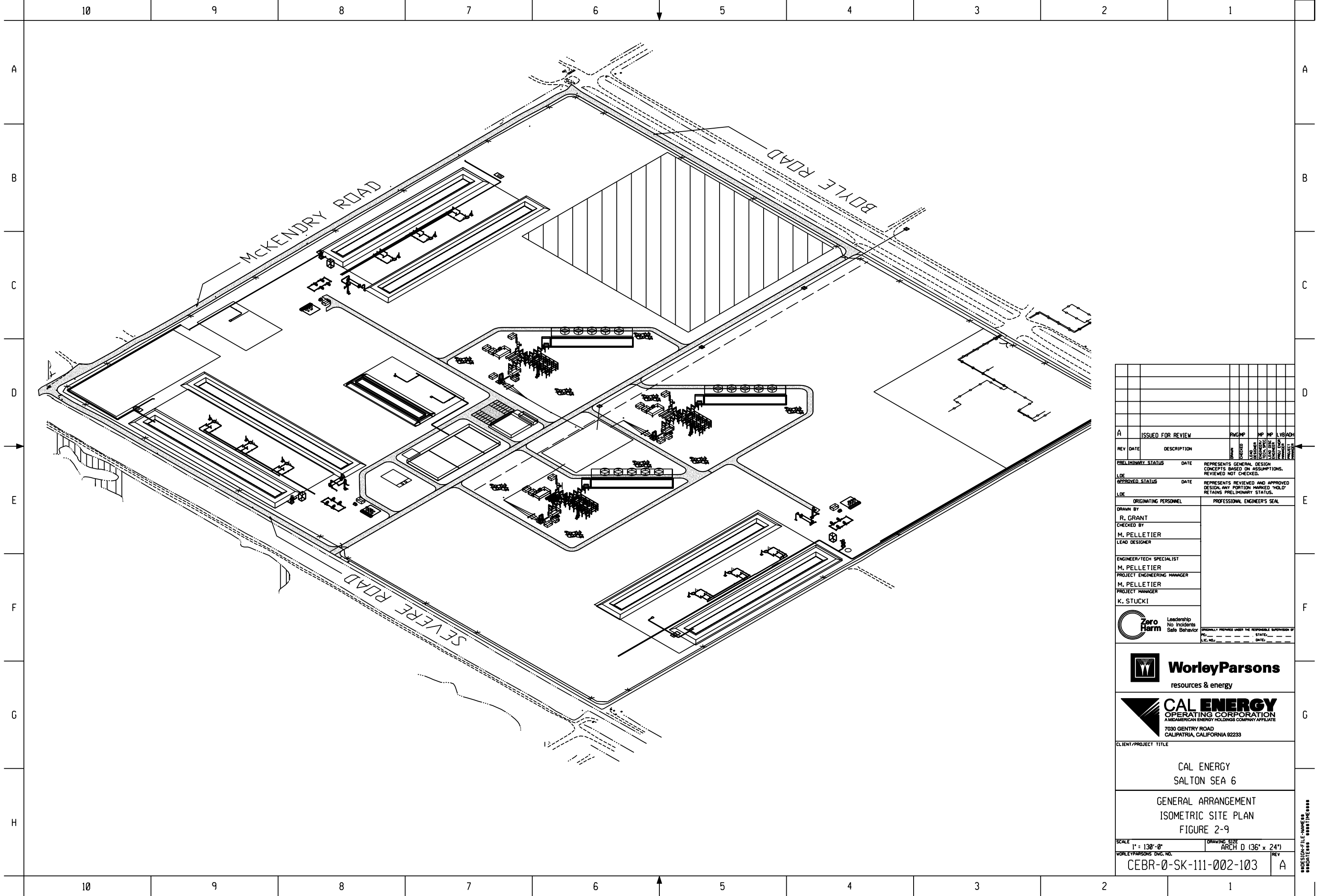
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DATE: ss
TIME: ss

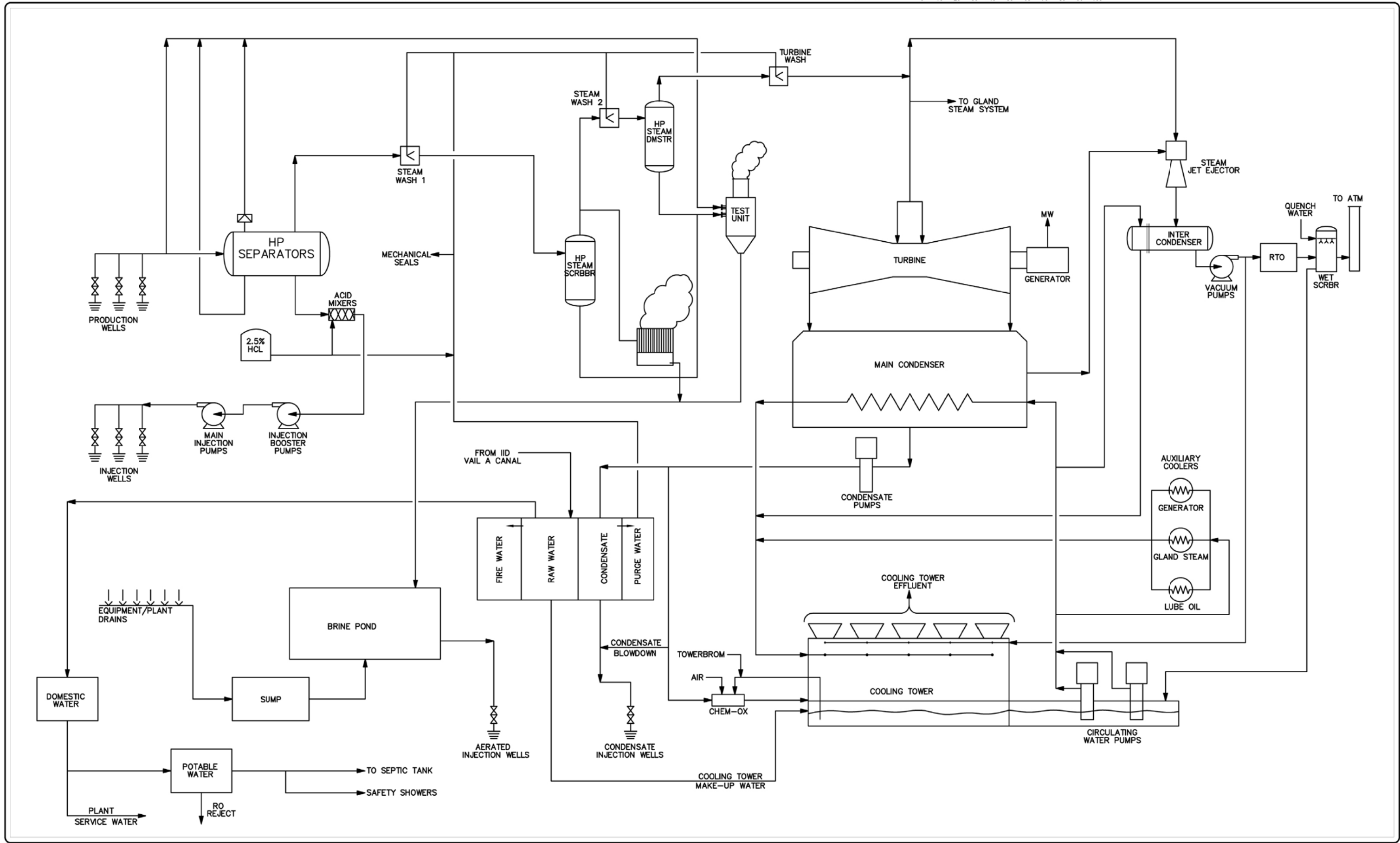


A		ISSUED FOR REVIEW		REV	DATE	DESCRIPTION	BY	DATE	DESCRIPTION
B		REV		DATE	DESCRIPTION	BY	DATE	DESCRIPTION	BY
C		DESIGN STATUS		DATE	REPRESENTS GENERAL DESIGN CONCEPTS BASED ON ASSUMPTIONS. REVIEWED NOT CHECKED.				
D		REV		DATE	REPRESENTS REVIEWED AND APPROVED DESIGN. ANY PORTION MARKED "HOLD" RETAINS PRELIMINARY STATUS.				
E		ORIGINATING PERSONNEL		PROFESSIONAL ENGINEER'S SEAL					
F		DRAWN BY		<div></div>					
G		CHECKED BY							
H		M. PELLETIER							
		LEAD DESIGNER							
		ENGINEER/TECH SPECIALIST							
		M. PELLETIER		PROJECT ENGINEERING MANAGER					
		M. PELLETIER		PROJECT MANAGER					
		K. STUCKI		PROJECT MANAGER					
				Leadership No Incidents Safe Behavior					
				resources & energy					
				CAL ENERGY OPERATING CORPORATION A MIDAMERICAN ENERGY HOLDINGS COMPANY AFFILIATE 7030 GENTRY ROAD CALIPATRIA, CALIFORNIA 92233					
		CLIENT/PROJECT TITLE		CAL ENERGY SALTON SEA 6					
		TYPICAL BRINE PRODUCTION WELL HEAD PIPING ISOMETRIC FIGURE 2-7B							
		SCALE		NONE		DRAWING SIZE		ARCH D (36" x 24")	
		WORLDWIDE DESIGN, INC.		REV		A		SECTION FILE NAME SECTION NUMBER	
		CEBR-0-SK-315-511-001							









REV	DATE	DESCRIPTION	BY	APRV
1	9/26/08	A ISSUED FOR REVIEW		
2				
4				

ISSUE	DATE	REV	DESCRIPTION
1	9/26/08	A	ISSUED FOR REVIEW
2			
4			

ENGINEERING MGR:	
PROJECT MGR:	
PROJECT ENG:	J. P. REVERENTE
DRAWN BY:	R. CALLES
DRAWN DATE:	9/29/09

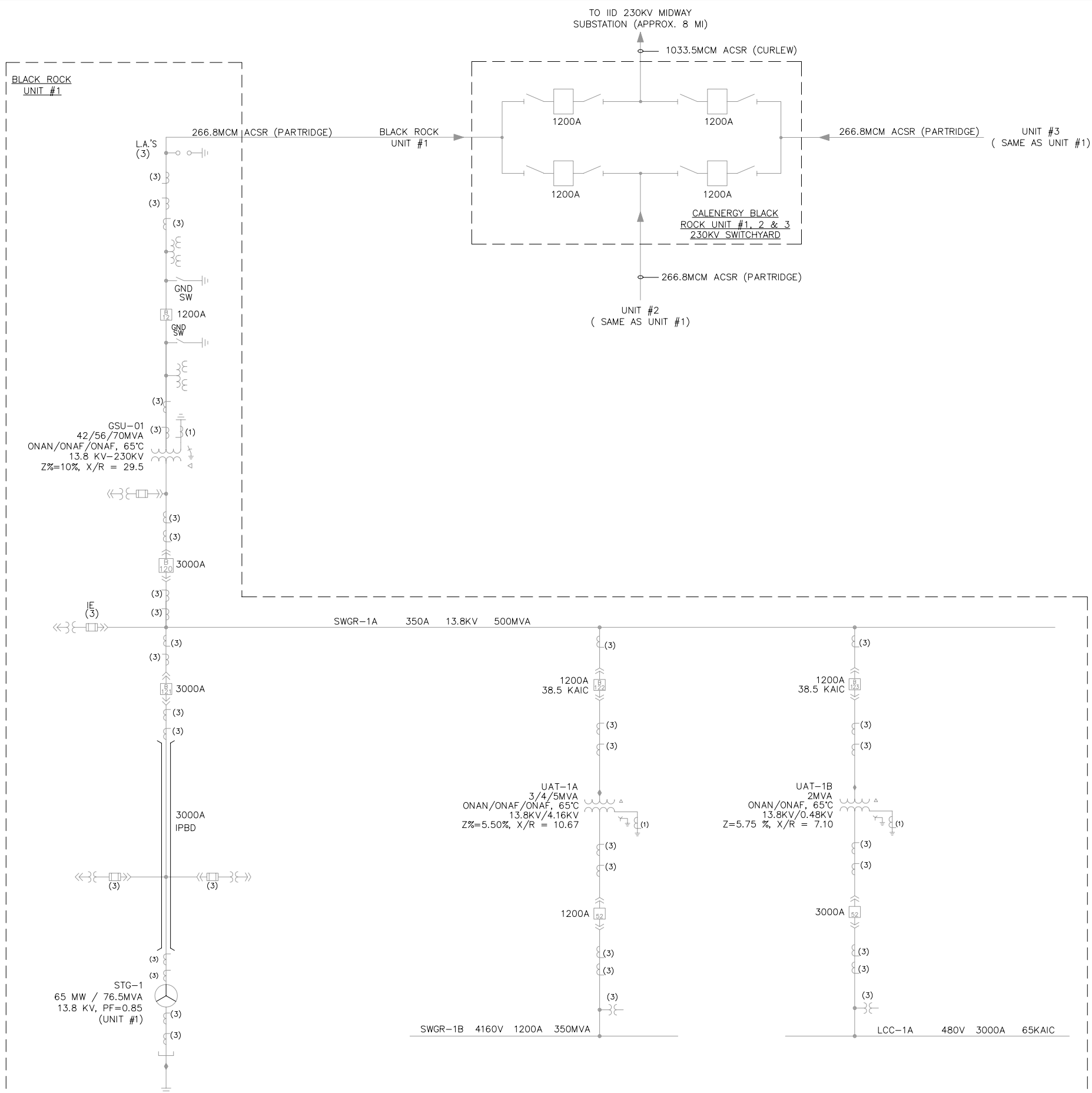
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Figure 2-12a

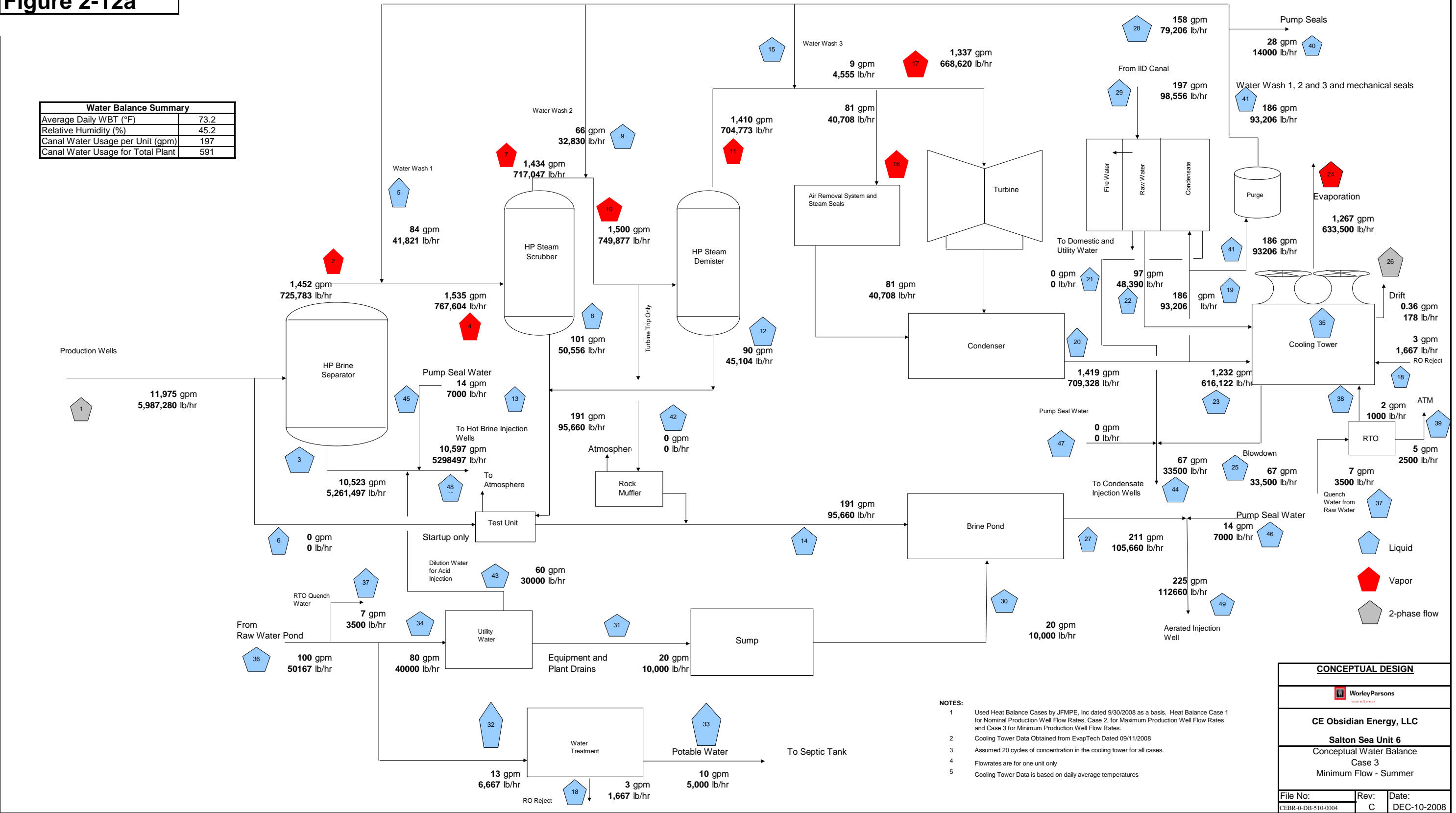
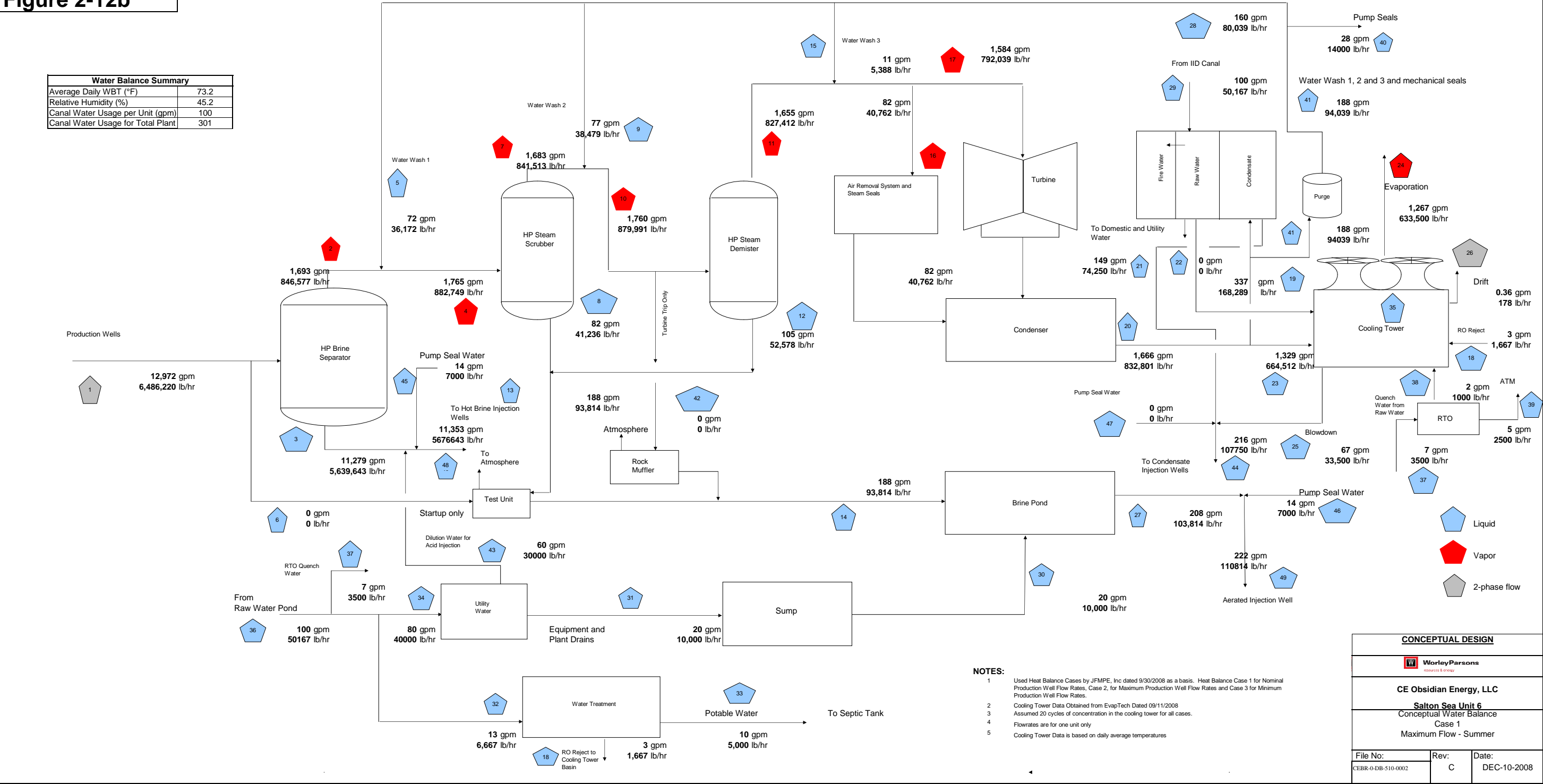
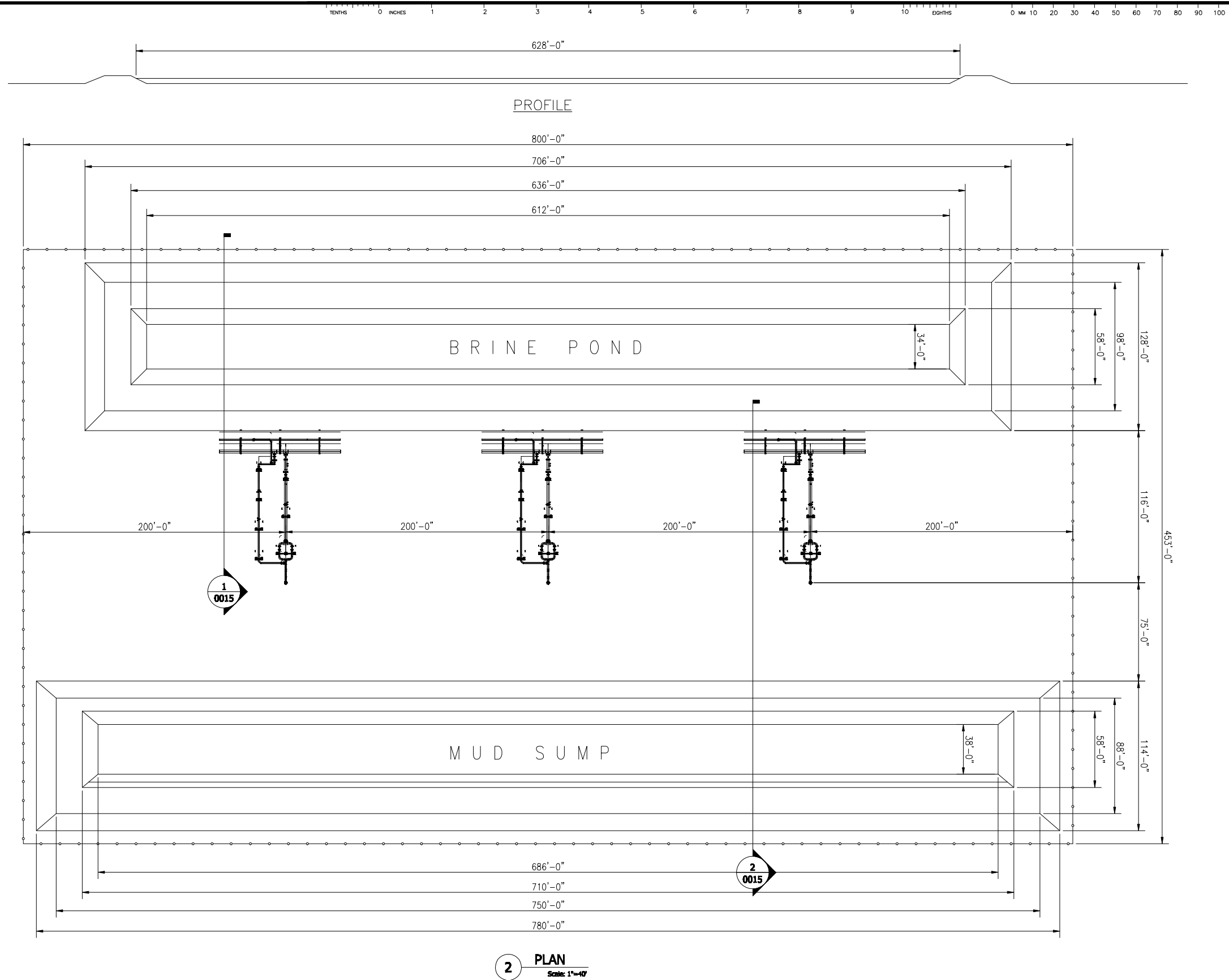


Figure 2-12b



CONCEPTUAL DESIGN		
WorleyParsons		
CE Obsidian Energy, LLC		
Salton Sea Unit 6		
Conceptual Water Balance		
Case 1		
Maximum Flow - Summer		
File No:	Rev:	Date:
CEBR-0-DB-510-0002	C	DEC-10-2008



2 PLAN
 Scale: 1"=40'



Amended SSU6 Project
Figure 2-13a
Brine Pond Plan View

REV	DATE	DESCRIPTION	BY	APPR
2	12/19/08	INCREASED LENGTH OF PAD	JH	JR
1	12/16/08	ADDED MUD SUMP	JH	JR

REVISION RECORD

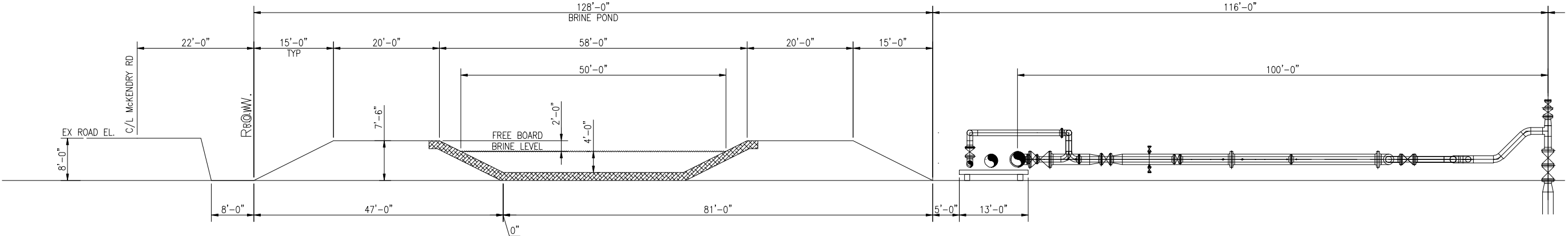
ISSUE	DATE	REV	DESCRIPTION
3	12/19/08	2	ISSUED FOR INFORMATION
2	12/16/08	1	ISSUED FOR INFORMATION
1	12/9/08		ISSUED FOR INFORMATION

ISSUE RECORD

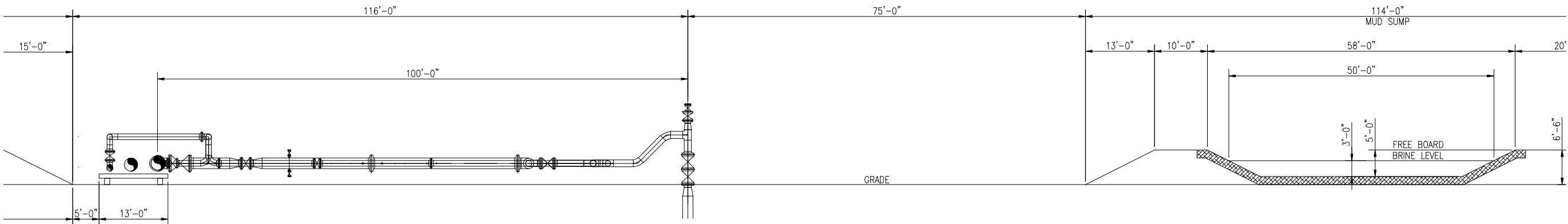
ENGINEERING MGR: ----
 PROJECT MGR: D HACKLEY
 PROJECT ENG: G FURMANSKI
 DRAWN BY: J HULA
 DRAWN DATE: 11/6/2008

BLACK ROCK PROJECT
McKENDRY ROAD PROFILE
PROD. WELL PAD
ELEVATION STUDY

PROJECT NUMBER
EP-08-014
 DRAWING NUMBER
100804-DY-0003
 SHEET NUMBER
0014




1 PROFILE
Scale: 1"=10'



2 PROFILE
Scale: 1"=10'

BRINE POND CAPACITY:
42'x620'x4'
=104,160 CF
=779,117 GALLONS

MUD SUMP CAPACITY:
44'x700'x3'
=92,400 CF
=691,152 GALLONS



CAL ENERGY
OPERATING CORPORATION
A MIDAMERICAN ENERGY HOLDINGS COMPANY AFFILIATE
7080 GENTRY ROAD
CALIPATRIA, CALIFORNIA 92233

Amended SSU6 Project
Figure 2-13b
Brine Pond Cross Section View

REV	DATE	DESCRIPTION	BY	APPR
2	12/19/08	INCREASED LENGTH OF PAD	JH	JR
1	12/16/08	ADDED MUD SUMP	JH	JR

REVISION RECORD

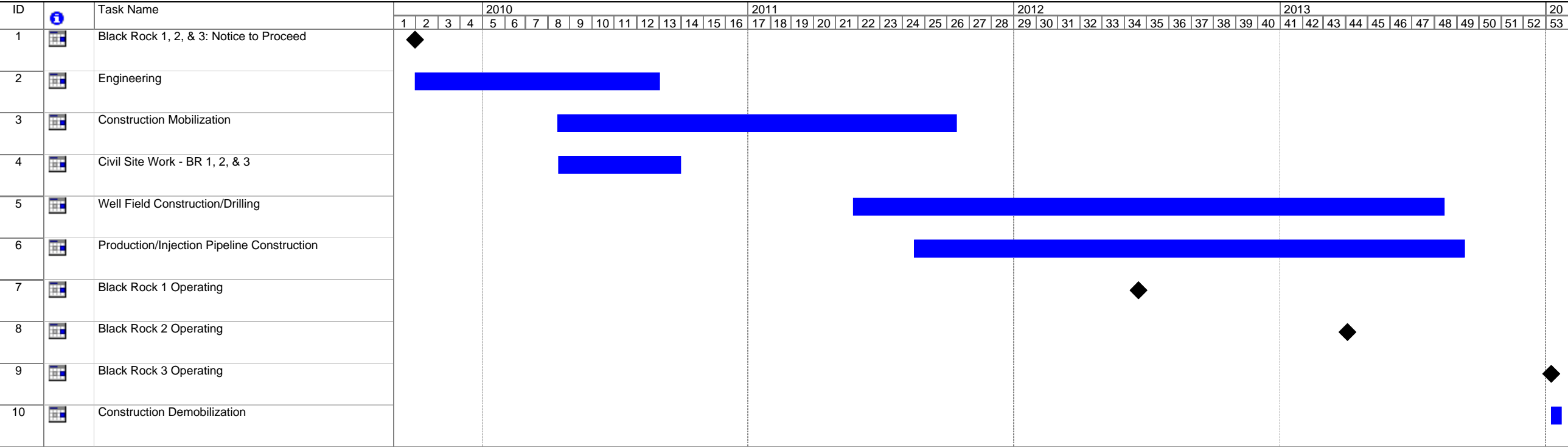
ISSUE	DATE	REV	DESCRIPTION
3	12/19/08	2	ISSUED FOR INFORMATION
2	12/16/08	1	ISSUED FOR INFORMATION
1	12/9/08		ISSUED FOR INFORMATION

ISSUE RECORD

ENGINEERING MGR: ----
PROJECT MGR: D HACKLEY
PROJECT ENG: G FURMANSKI
DRAWN BY: J HULA
DRAWN DATE: 11/6/2008

BLACK ROCK PROJECT
McKENDRY ROAD PROFILE
PROD. WELL PAD
ELEVATION STUDY

PROJECT NUMBER
EP-08-014
DRAWING NUMBER
180804-DY-0003
SHEET NUMBER
0015



Project: Black Rock Project 1, 2, & 3 Construction
Date: Thu 1/15/09

Task

Milestone

External Tasks

Split

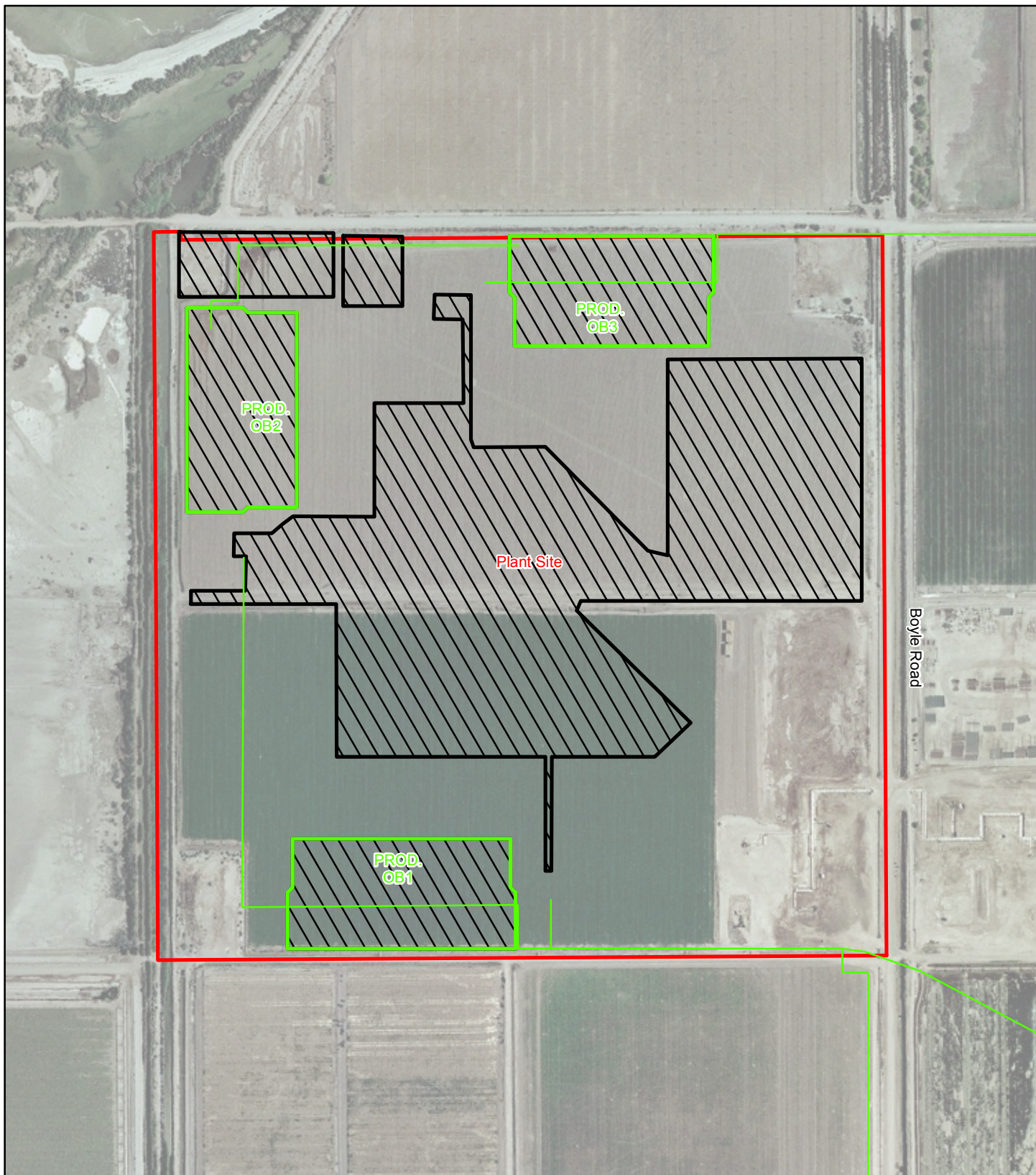
Summary

External Milestone

Progress

Project Summary

Deadline



Legend

- Plant Site
- Proposed Well Pad
- Proposed Pipeline
- Areas Requiring Topsoil Removal

1 inch = 500 feet

0 250 500 1,000 Feet



Amended SSU6 Project Figure 2-15 Areas Requiring Topsoil Removal



AECOM

Project: 12676-001
Date: February 2009